ELECTROLYSIS, THERMOLYSIS AND THE BLEND:

THE PRINCIPLES AND PRACTICE OF PERMANENT HAIR REMOVAL

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The Principles and Practice of Permanent Hair Removal

TO HENRI E. ST. PIERRE,

the inventor of the Blend
whose dedication to the field of
Electrology inspired this book.

Electrolysis, Thermolysis and the Blend:

The Principles and Practice of Permanent Hair Removal

by

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ELECTROLYSIS, THERMOLYSIS
AND THE BLEND

The Principles and Practice
of Permanent Hair Removal

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PREFACE

The purposes of this book are twofold: to serve as a textbook for the student just beginning her study of the field and, at the same time to function as a reference source on all phases of the field for the practicing electrologist. To fulfill this dual role, the following chapters contain far more material than is normally found in textbooks designed specifically for students. The format of the book has been arranged to coincide with the electrology curriculum requirements of California and other states, but the principal concern of the book has been to provide information and advice on problems of immediate practical relevance to both the student and the practitioner.

There are two ways to read this book (that is, at least two), and the particular manner you select will depend upon your own objectives. If you intend to read the book merely to inform yourself of the nature of the field, then a straight forward approach to the book is suggested. In their present sequence the following chapters tend to build from basic principles and facts to the theory of technics and finally to the actual practice of being an electrologist. Read in this manner the book makes it clear *why* certain practices are better than others. A fundamental understanding of the theory behind the practice is important.

There is another way to read this book if it is being used in conjunction with classroom or personal instruction. Because practical judgment is the most important and also the most difficult kind of "knowledge" you can attain, it is important that you begin to learn the use of your equipment as soon as possible. To avoid delay, it is suggested that the student read Chapters II, III, V, VIII, IX and X first, in the order listed. These chapters will acquaint you with all of the information needed for operating the equipment properly. Each time you encounter advice on how to observe skin and hair characteristics, how to operate equipment, and how to conduct experiments, you ought to put it into practice immediately; otherwise the information will be of little use in making an electrologist of you.

As you begin to master your technic, you may then go on to read Chapters XI, XII and XIII, which deal more specifically with practical aspects. Finally, with your mastery of the practical side of the profession fully underway, it will be possible to return to the book in your free moments to finish those portions previously unread.

It must be mentioned here that the term "electrology," which is used throughout this book, is intended to denote the entire field of permanent hair removal by electrical action. This term has not been universally accepted, but it is the official designation under the California Cosmetology Act, and it seems to be the most appropriate of all the alternatives. Consider it thus: if the dermatologist's field is called "dermatology" and the endocrinologist's field is called "endocrinology," does it not follow that the electrologist's field should be called "electrology?"

You will note that both the electrologist and the patron are consistantly referred to as "she" or "her" throughout the book. While it is true that the profession does include a number of competent male electrologists, the field is predominately a feminine one. Therefore, for grammatical simplicity, we have elected to employ only the female designation. This is the case with patrons as well. The number of male patrons may be presently increasing, but they still constitute only a small percentage of the total patronage.

Much of the advice and information offered in the following pages represents the fruits of nearly twenty years of research and practice on the part of Arthur R. Hinkel. Having operated schools of electrology since 1948, he has had ample opportunity to observe the effects of various technics and practices. Many observations offered here have never before appeared in print—especially those which appear in the chapters on technics and treatment procedures. Richard W. Lind is responsible for the organization of the book and for research into those subjects which are not directly related to the theory of technics.

Your authors wish to express special thanks to Elsie Jerina, whose careful typing and scrupulous attention to grammar and spelling have enabled us to keep such errors to a minimum and to Arthur "Tony" Hinkel for his invaluable assistance in correcting proof. We also wish to acknowledge our indebtedness to the Academic Press of New York and the University of Chicago Press for their permission to republish certain diagrams and illustrations.

ARTHUR R. HINKEL

RICHARD W. LIND

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Chapter I

The Causes of Hair Problems

The purpose of this chapter is to provide a complete and comprehensive survey of the biological causes of hair growth. Information of this kind is important to the student of electrology for three reasons. First of all, as the "expert" in the field, you will often find that you have to explain to clients the biological origin of hair and how it comes to be a problem. Secondly, you must be able to apply your knowledge to each new problem that comes through your door; the nature of the problem frequently determines the strategy for treatment, especially when it involves an alteration in the patron's glandular balance. Finally, obvious signs of glandular imbalance should be recognizable to you, so that you can direct your client to specialists who are trained to handle the disorder. A knowledge of the principles and problems of hair biology and the glandular system is essential to competency in the field.

The Need For Appropriate Terminology

The majority of cases which confront the electrologist are completely *normal* instances of "excessive" hair growth. In most cases, a patron's hair problem will have emerged during puberty, pregnancy or menopause, the three major physiological changes which can occur within a woman's lifetime. These events do not invariably produce unwanted hair, of course, but the incidence of increased hair-growth following these events is so frequent—especially among women in their "change of life"—that we can not consider it "abnormal." Not any more than we could consider baldness abnormal in a man simply because it does not occur in every instance.

It is a mistake, then, to call every person that walks into the electrologist's office a "patient" and to regard him or her as "suffering" from hypertrichosis (a frequent mistake among some electrologists). Let us consider a definition of the term "hypertrichosis" offered by a leading specialist, Lee McCarthy, M.D., in *Diagnosis and Treatment of Diseases of the Hair*: . . . .

> Hypertrichosis is the term used to denote excessive and abnormal growth of hair, i.e., a growth of hair on any part of the body which is more than that usually seen in individuals of the same sex, age and race as the person under consideration.

Hypertrichosis, then, is an *abnormal* amount of hair. It is usually due to abnormal conditions brought about by disease or injury.

The above definition helps us appreciate that it is entirely inappropriate to apply the term "hypertrichosis" to those new growths of unwanted hair on women going through their major physiological changes. Such people have *superfluous hair*, excess hair which is not abnormal for their age and sex, but is simply undesirable socially. By thus distinguishing between "hypertrichosis" and "superfluous hair," the electrologist will be employing terminology which is much more appropriate to the problems with which she must deal.

Appropriate terminology is a key factor in successful relationships between the electrologist and the public. The student must realize at the outset that electrology is, in no sense of the word, a medical practice, as certain electrologists would have us believe. Referring to patrons as "patients" and talking about "cures" is not only inaccurate (no disease is being treated); it is also detrimental to the business of electrology since only those patrons willing to consider themselves as "afflicted" would ever subject themselves to treatment.

The problem which the electrologist treats is essentially a cosmetic one. Even in those cases where excessive growth has been caused by an unusual glandular imbalance, the intention of electrology is not to alleviate the illness but to restore the appearance of the individual. There are, of course, those instances where ingrown hairs must be removed for reasons of health, but they constitute a small percentage of the business. The electrologist is primarily concerned with beauty, and her manner of dealing with the public should reflect this. Only when it becomes common knowledge that superfluous hair is perfectly normal for certain periods in a woman's life will electrology become generally accepted and utilized.

What Stimulates New Hair Growth?

A brand new growth of hair does not spring from the soil like a weed; it requires encouragement. The general causes of that encouragement will occupy the greater portion of this chapter. At present, however, we are interested in the specific conditions that must be present at the site of each potential hair in order to activate its growth.

Two local factors, either together or individually, have the capacity for directly initiating or accelerating the growth of hair: one is *increased blood supply*; the other is *hormone stimulation.* Let us consider their effects respectively:

(1) **Increased blood supply.** If a vellus (or lanugo) hair is already growing from, say, the lobe of a sebaceous (oil) gland, an increase in the blood supply to the immediate area greatly enhances its growth. As if the hair were being "fertilized" by the influx of this unaccustomed nourishment, it tends to grow deeper and coarser, becoming an "accelerated" lanugo hair (i.e., one which is just beginning to acquire a bulb and take on pigmentation; it is not yet a "terminal hair"). A plentiful supply of blood is necessary for the development of these deeper kinds of hair. Nevertheless, increasing the blood supply in an area where there are no hairs at all will not create new hairs. Blood supply merely nourishes existing hairs.

(2) **Hormone stimulation.** Certain hormones, on the other hand, seem to have the capacity for initiating the growth of new hairs where none existed previously. Of course an excess of hormones does not cause hairs to leap out of the flesh wherever it flows. If that were the case we would have bristles sprouting from our tongues and our eyeballs. The fact is that hormones have no "hair-growing" power in themselves. What they do is to stir to life certain cells near the sebaceous (oil) glands. These hair-germ cells (as Montagna refers to them) need only be "turned on" by the chemical action of the hormone. They then begin to multiply and divide, creating a lanugo hair structure which may continue to accelerate in growth. Thus, the action of certain hormones is capable of eventually bringing about a coarse, pigmented hair where no hair at all had existed.

It is obvious that the potentiality for hair growth will vary greatly from area to area on the human body. We can observe this in the young man in late adolescence, for instance. With unaccustomed quantities of male hormones coursing through capillaries throughout his skin he nevertheless fails to acquire hair from his nose to his toes. The growth tends to follow a normal pattern of appearance in the axillary and pubic regions, on the face and lastly on the chest. Such areas seem to have the highest potential, that is, the highest sensitivity to hormone stimulation. Likewise in women, when a glandular imbalance occurs, these same areas are the first to show an increase in growth. Conversely, regions such as the center of the forehead, the palms of the hands and the soles of the feet never acquire hair, even among the most hirsute individuals.

Degrees of sensitivity to hormone stimulation also vary from area to area even from point to point within a given area on the body. Photographs of microscopic sections of any hairy area show that each follicle from which a hair is growing is surrounded by isolated sebaceous glands which have no hair growth of their own. Apparently some factor makes one set of germ cells more active than its neighbors. This is further evidenced by the fact that every individual shows a large number of downy hairs in the bearded, axillary and pubic regions that never become transformed into terminal hairs, even in a forest of the coarser, darker hairs. Since the flow of hormones is presumedly available to all of these germ cells in more or less equal quantities, we can only conclude that the uneven reaction is determined by unequal distribution of growth potential in the cells themselves. Thus, when certain hormones begin to flow through the tiny capillaries that feed the epidermal region, only those cells which are most sensitive to its stimulation begin to divide and multiply, forming a new hair structure.

What Conditions Cause Stimulation Of New Hairs?

It follows from what has been discussed above that any conditions which can cause an increase in blood supply to the skin or a general excess of certain hormones in the circulatory system may ultimately be the cause of either hypertrichosis or superfluous hair. These general conditions have, in the opinion of the authors, never been adequately classified from the unique standpoint of the electrologist. Medical books tend to categorize the causes of hypertrichosis into "irritation" and "non-irritation" (Bartels) or "congenital" and "acquired" (McCarthy) and the like. These terms strike your authors as curiously awkward classifications in view of the variety of conditions that make excessive growth of hair possible. Therefore, in an attempt to clarify the matter for the electrologist, who must often explain her task to the public, a simple but comprehensive classification has been adopted.

There appears to be three general categories of causes for excess hair, which we shall label as (1) *congenital,* (2) *topical* and (3) *systemic.* The first term, "congenital," has been retained from McCarthy to refer to *normal* racial and familial growth patterns as well as to those *abnormal* conditions, which, although rare, are responsible for inherent hypertrichosis from birth. "Topical" conditions are exactly what the word implies: local, limited to the skin or a particular portion of it. Lastly, all growths which are neither congenital nor topical are considered to be of "systemic" origin: that is, they have been brought about by a change in the chemical structure of the endocrine system. This latter category is further divided into *normal* and *abnormal* systemic changes. All of these categories need to be studied in depth. These categories are outlined below:

I CONGENITAL PATTERNS
  (A) Normal Patterns
  (B) Abnormal Patterns
II TOPICAL CAUSES
III SYSTEMIC CAUSES
  (A) Normal Patterns
  (B) Abnormal Patterns

(I) Congenital Patterns

Everyone comes into the world with some pre-established pattern for hair growth, "built-in," as it were, as a part of his natural equipment. This pattern is inherited from parents whose own genetic structures combined to shape the new one. Hence, the way in which a person's hair naturally tends to grow, either at birth or later in life, is called a "congenital" pattern, because he is "born with" a potentiality for that kind of growth; it does not come about as the result of environmental influences.

(A) NORMAL PATTERNS

Because we are all familiar with the "normal" distribution of hair, there is little need to catalog its various locations here. But it is of general interest to note how growth patterns on various parts of the body have, through the principle of "natural selection," evolved into organs that help the body adapt to its environment. Most hair, it has been observed, serves a protective function. In some instances hair also helps to retain body heat. Let us briefly examine some of the specific functions of hair at various locations:

(1) Eyelashes (cilia) prevent dust or dirt from entering the eye and also help to shade the eye from excessive sunlight.

(2) Eyebrows (supercilia) also filter dust and dirt to a minor degree and help to shade the eye from sunlight. Additionally they form a protective cushion for the ridges of the eye socket.

(3) Nostril hair (vibrissae) screens incoming air, filtering out dust and large particles that might otherwise collect in the lungs.

(4) Scalp hair (capilli) serves as an adornment of the body. But such a "function" is by no means an evolutionary one; man (or, more correctly, woman) has been the one who made hair an object of beauty.

Nature has, on the other hand, placed hair on the head merely to provide protection against concussion and to help retain body heat by shielding the head from the rain, snow and cold weather.

(5) Body hair, by which term we include underarm hair (hirci), pubic hair (pubes) and others, acts generally as a protection against friction. It is for this reason that patches of excess hair will appear in many places where the epidermis is continuously irritated.

It is presumed by some people that man at one time was covered with much more hair than he now has, and that his hair formed a "fur coat," which kept him warm in winter. Whether or not this conjecture is true may possibly never be determined. If it is true, however, we must somehow account for the fact that people from the warm Mediterranean areas are more hirsute than cold-weather Scandinavians.

Significantly, no one undergoes an increase in hair growth when transported to a colder climate in the way that he would if his skin were to be irritated by friction, fire or chemicals. In the light of this fact, it is difficult for us to conclude that body hair is intended for warmth. Protection from irritation seems to be its principal function.

What we would call a "normal" distribution of hair will vary from one ethnic group to another. As mentioned above, Nordic or Anglo-Saxon strains (Scandinavians, Germans, and British) are less hairy than the Mediterranean and Semitic peoples (Syrians, Hebrews, North Africans, Greeks, Italians and Spaniards). And, in general, Caucasians are more hairy than Negros. Least hairy of all are the Mongolians, American Indians and the Orientals.

It is obvious that one's concept of beauty depends a great deal on what he has become accustomed to seeing. The facial hair of Mediterranean women is not at all bothersome to their male counterparts. For example, among the Spanish and Italians a woman's moustache is considered "sexy." In few places besides the United States are a woman's hairy legs regarded unattractive. Thus, whether one's hairiness is considered an adornment or an "eyesore" depends pretty much on geography.

It is only in a mixed society, such as our own, that a normally hirsute person can become embarrassed or even ashamed of a natural condition that might have seemed attractive in the person's place of origin. This is just another reason why the electrologist can not consider herself a practitioner who treats abnormal conditions. Many of her clients will have hair patterns which are perfectly normal for them.

(B) ABNORMAL PATTERNS

Every once in a while the electrologist will confront a case of congenital hypertrichosis. This condition afflicts the person who has had the misfortune of inheriting a propensity for unusually excessive hair growth. Congenital hypertrichosis may appear at birth, or it may emerge later in life. People thus afflicted are sometimes covered from head to toe with a heavy growth, lacking hair only in those areas that normally would have no hair at all, such as the palms of the hands, bottoms of feet or the forehead. Danforth has carefully studied cases and found no glandular imbalance to which the growth might be attributed. The excessive hair is simply that result of an unusual genetic structure. Fortunately, cases of congenital hypertrichosis are rare. Because of the extent and heaviness of the growth, its treatment requires many years.

(II) Topical Causes

In response to any potential threat to the epidermis by rubbing, chafing, burning or other causes of irritation, nature has provided the body with an "ingenious" means of defending itself. Sustained irritation almost always stimulates hairs in the immediate vicinity of the affected area to grow deeper and coarser, thereby creating a mat of hair that covers the skin and protects against further irritation. The mechanics of this process is not overly-complicated. Wherever there is irritation, there is an increase in blood supply to the surface of the skin. When this increased blood supply reaches the follicles, any hairs growing from those follicles receive more nourishment than usual. They therefore tend to grow deeper and coarser. It can thus be seen that *anything that will cause an increase in blood supply to the surface of the skin is capable of becoming a topical cause of hair growth.*

Although moles and birthmarks are not sources of irritation as such, they do fall within the general definition of topical causes of hair insofar as their presence is the cause of an unusual development of capillaries near the surface of the skin. Moles and birthmarks are frequently a cause of excessive hair growth. It is not unusual to find clusters of thick bristles sprouting from moles or other surface blemishes in an area otherwise devoid of noticeable hair. This occurs as the result of the specialized blood supply system which nourishes the follicles located in the blemish itself. These follicles thereby become more productive than their neighbors.

Moles and birthmarks pose a special problem to the electrologist. Although to your authors' knowledge no case of cancer has ever been traced to treatment by an electrologist, there is a general prejudice against treating hairy moles with an electric needle by anyone other than a person trained in medicine. Insurance companies specifically exclude treatment of moles, warts or other such unusual skin defects from liability coverage, precisely because certain kinds of skin growths have been known to be malignant. (For further information on this subject, see Chapter VI on dermatology).

It has been shown how almost any form of physical irritation on the surface of the skin will produce an unusually luxurient growth of hair to protect the skin. These topical causes include plaster, scratching (Hebra's prurigo), and application of x-rays, ultra-violet lights, etc. Even sunburn, if it occurs frequently, will lead to unusual growth, as seen in the case of outdoor sportsmen or workers, whose oft-burned noses sometimes develop a growth of soft lanugo down after a few seasons in the sun. Everyone has a barely visible crop of lanugo hair on his nose, but it is only after his nose has been constantly irritated by something like a continuous series of second-degree burnings by the sun that the growth is encouraged to grow to a visible length.

The commonest experience of a topically-caused growth of hair occurs when an area has been bandaged or has been encased in a cast or a plaster for two or three months. Constant chafing has caused a protective covering to appear. Usually the growth disappears shortly after the covering has been removed. Because of its short life, most topically-caused hair is of little clinical interest. Only such permanent conditions as hairy moles and birthmarks become the object of electrological treatment. Often, too, the area surrounding a scar will manifest an unusual growth that has to be treated.

One topical consideration of great interest to the electrologist is the effect that tweezing has on hair growth. Many women attempt to remove unwanted hairs, especially those around the eyebrow or on the chin by plucking them out by the roots. Granted, when a woman tweezes out unwanted hair it does take longer to grow back than if, say, it has been shaved off at the skin level. But what this woman does not realize is the fact that *repeated epilations eventually cause most hairs to regrow more quickly and to become darker, coarser and more firmly rooted.* Only a fraction of all tweezed hairs are ever permanently eliminated. Thus a woman who tweezes is simply letting herself in for greater hair problems than she had before she tweezed; rather than solving her problem, she is worsening it.

As with other topical causes, increased blood supply is the cause of the accelerated growth of tweezed hair. Each time a hair is tweezed out of its follicle, a good portion of the bottom half of the follicle is torn out. The damage is not sufficient to prohibit future growth but it is enough to cause the follicle to reconstruct itself a little sturdier with a better developed capillary system each time. The difference from one tweezed hair to the next may be imperceptible, but, eventually what may have been a few annoying lanugo hair will have become full-grown terminal hairs, bristling in defiance of their owner's attempts to evict them.

Impracticability is not the only reason for refraining from tweezing. It has been found that occasionally when a hair is plucked from a soft sensitive skin, the entire sheath of the follicle often comes out with it. The resulting cavity quickly becomes infected with the organisms, usually yellow staphylococci, which normally inhabit the follicular pore. Deep pustules that result leave a whitish scar or pit.

Shaving, on the other hand, has been found to have no effect whatsoever on hair growth. This fact has been demonstrated by a number of experiments on the subject. Trotter, for example, conducted a series of experiments to test the effect of shaving various parts of the body in adults of both sexes. By pairing off accurately symmetrical areas on each side of the test subject, Trotter was able to observe the results of shaving on one of the areas in relation to its "twin," which remained unshaven. She made measurements of both areas before and during the time of testing, which involved shaving the test area daily. After several months of this, she could detect no difference in amount, length, diameter or pigmentation of either the lanugo or the terminal hairs present on either side. A similar test at Duke University has produced the same negative results.

Such evidence seems to support the hypothesis that only an irritation of an intense nature sustained over long periods of time is able to accelerate hair growth. Rubbing the skin once daily with a shaver is insufficient irritation to cause a marked change in the circulation pattern.

In the light of these facts about tweezing and shaving, we are able to evaluate such common feminine remedies for superfluous hair as waxes and dipilatories. Waxing, for instance, can now be appreciated as a specialized tweezing method. The practice is to apply a heated wax to the surface of the skin, letting it cool and harden. When it is pulled off it removes most of the hairs and their roots. Most beauty shops employ this method, often with misleading claims about the permanence of the removal. Actually, as with tweezing, continued treatments will lead to darker, coarser hairs. Furthermore the method must be repeated every three or four weeks in order to keep the growth out of sight. Lastly there is always the possibility of the infection that may result from tweezing.

As was suggested earlier, any form of tweezing—including waxing—will meet with some success. On certain people and on certain areas, particularly the eyebrows, some lanugo and accelerated lanugo hair will "give up" after being uprooted many times. These instances serve as the "shining examples" upon which beauticians base their claims for waxing.

Many cases where waxing has "worked" are questionable. Waxing "appears" to be most successful when used on the limbs of women after their late forties or early fifties. This is usually the result of glandular changes, which would ordinarily result in a diminishing of hair regardless of hair-removal practices. Waxing simply accelerates the natural hair loss.

The most disastrous consequences waxing can produce occur on the face. There are some fine lanugo and "accelerated" lanugo hairs on the face that will respond favorably to waxing. But most other hairs in the same area will, on the contrary, be stimulated to greater depth and coarseness. Thus face waxing, in the majority of instances, will lead to a superfluous hair problem that never existed previously—a face full of scattered, heavy bristles.

Depilatories, on the other hand, do not involve any plucking of the hair. Various preparations on the market today come in the form of a cream or paste which is applied to the skin. After it has been left on the skin for several minutes, the depilatory is washed off, and the hair comes off with it. Since this process is really a chemical shaving-off of the hairs at the skin level, the use of depilatories does not, like tweezing, encourage an accelerated growth in the treated area. Depilatories, therefore, have a decided advantage over waxes in this regard.

Among the disadvantages of depilatories is the nuisance factor; treatments must be repeated only a little less often than shaving. Furthermore, it is not uncommon to see a dry or "weeping" type of dermatitis following the use of depilatory pastes or creams. This condition lasts from twelve to twenty-four hours after application. Thus the only advantage of depilatories over ordinary shaving is the "closeness" of the shave. This advantage can hardly compensate for the messiness and possible irritation involved in the use of depilatories.

One last implication of topically caused hair growth must be mentioned before leaving the category of topical causes. The question concerns electrology. Not infrequently, it seems, "seasoned" electrologists are moved to ask whether or not the electrologist's needle itself might be the stimulus of new growths of hair. After all, they reason, is not electrology a form of surface irritation? These electrologists have in mind the fact that on occasion one finds that a woman's hair growth will accelerate after treatment has begun. Could the treatment have caused the acceleration?

To answer this question we must re-examine the basic principles involved in accelerated hair growth. Almost every instance of accelerated growth, we have found, has been the result of a sustained source of irritation. Perhaps the only exception to this is the case of scars. A severe scar is often surrounded by an unusual growth of hair. But to put this exception in its proper perspective we must recall that small cuts or burns are never accompanied by any such growths. Only large lesions effect permanent changes in circulation. Conclusion: *nothing of such minor intensity or of so short duration as the electrical action of the electrologist's needle could alter the permanent cutaneous blood supply sufficiently to cause a marked increase in hair growth.* There is no experimental evidence that implies that it could be such a cause.

Since the incidence of increased growth following treatment is rare, it is quite probable that the increase is due in those unusual instances to a coincidental change in the hormonal balance. As a woman enters her "change of life," for example, the alteration of her body chemistry will cause the lanugo hair on her face and certain parts of her body to accelerate. Alarmed, she may immediately visit an electrologist. What neither she nor the electrologist suspects is that the change has only begun. As the hormonal balance continues to alter, the unwary electrologist finds the hairs growing in faster than she can take them out. To both patron and electrologist it may seem that the treatment is doing more harm than good.

(III) Systemic Causes

To appreciate how body chemistry can effect hair growth, one must have a rudimentary understanding of the endocrine system. Hormones, which are excreted by the *endocrine glands,* control the growth and development of every organ of the body, including the hair. The interrelationships of these glands are so complex, however, that scientists have only begun to understand the total mechanics of the endocrine system. Therefore, the brief outline of the function of the endocrine glands offered below is not to be construed as a detailed analysis. It is no more than a "primer course" for electrologists.

THE ENDOCRINE SYSTEM

The endocrine system is not an isolated machine carrying out a distinctly specialized function in the same sense that, for example, the heart and lungs do. The chemicals which these organs pour into the cirulatory system are so closely integrated with the life processes of the body that there is probably not a single activity that is not affected by them. Growth, aging, sex, metabolism and nutrition are among the principles of life over which these glands hold complete control. In close cooperation with the nervous system and the body fluids, they correlate and coordinate the activities of the body as a whole.

Endocrine glands are usually called glands of internal secretion because of the way they exude their chemical products directly into the blood stream. Each gland is composed of millions of cells, each of which is a miniature hormone factory. In most cases the hormone passes from these cells directly into circulation. Some glands like the thyroid can store up their products in special sacs, releasing them into the blood stream when called upon to do so.

Once these hormones enter the blood stream they travel indescriminately throughout the body coursing through every artery, vein and capillary in the circulatory system. [6]Some hormones such as thyroid hormone appear to act on almost every cell of the body. Others, however, limit their activity to certain type of tissue. These are referred to as the "target" organs of the particular hormone in question. We have already discussed briefly how the hair follicle can be a "target" organ for those hormones which encourage its growth. In a similar manner thousands of other organs are affected by a vast arsenal of hormones. The results of this multiplicity of activities can be classified into three groups: (1) morphogenesis, which includes growth, metamorphosis and sexual development; (2) *integration* of all of the autonomic (automatic) processes of the body and instinctual patterns of behavior; and (3) *maintenance* of the internal environment by regulating disposition of food stuffs, electrolytes and water within the body.

The way in which hormones produce their effects is not clearly understood. They seem to act as a *catalyst*, accelerating processes which would scarcely proceed without them. It is argued by some endocrinologists, however, that hormones act indirectly by increasing the local concentration of certain enzymes which are themselves the direct cause of change. In either case, hormones activate the rate of specific processes without contributing significant amounts of energy to the tissues involved.

A significant aspect of the endocrine system is the fact that one hormone may assist another, while, at the same time being antagonistic to a third. In such a way, the secretions of one gland can control the effectiveness of secretions of others. This interaction of hormones is one means of achieving an overall balance in body functions.

Another aspect of achieving a balance of functions is the way in which hormones control the activity of the endocrine glands themselves.

When a specific gland is a target organ for a hormone secreted by another, its own production of hormones is enhanced or inhibited, according to the nature of the hormone effecting it. The anterior portion of the pituitary gland (the adenohypophysis) is generally regarded as the "director" or "master gland" of the endocrine system because of the controlling role its secretions play in the activity of other organs. But the pituitary gland is in turn affected by certain hormones produced by the very glands it controls. It is also regulated indirectly by the nervous system. With so many little mechanisms to go wrong, it is surprising that glandular imbalances occur as infrequently as they do.

Figure 1 shows the anatomical location of the glands of the endocrine system. Since the scientist cannot simply open the body up and watch the glands in action he has only been able to learn about the role of each gland by indirect means, such as the removal of certain glands, or the injection of glandular abstracts, or the study of diseases caused by malfunctioning glands. The following is a brief outline of scientist's findings about the functions of the endocrine system:

The *pituitary* gland, which looks like a cherry dangling from the base of the brain, is made up of three lobes (parts). The *posterior*

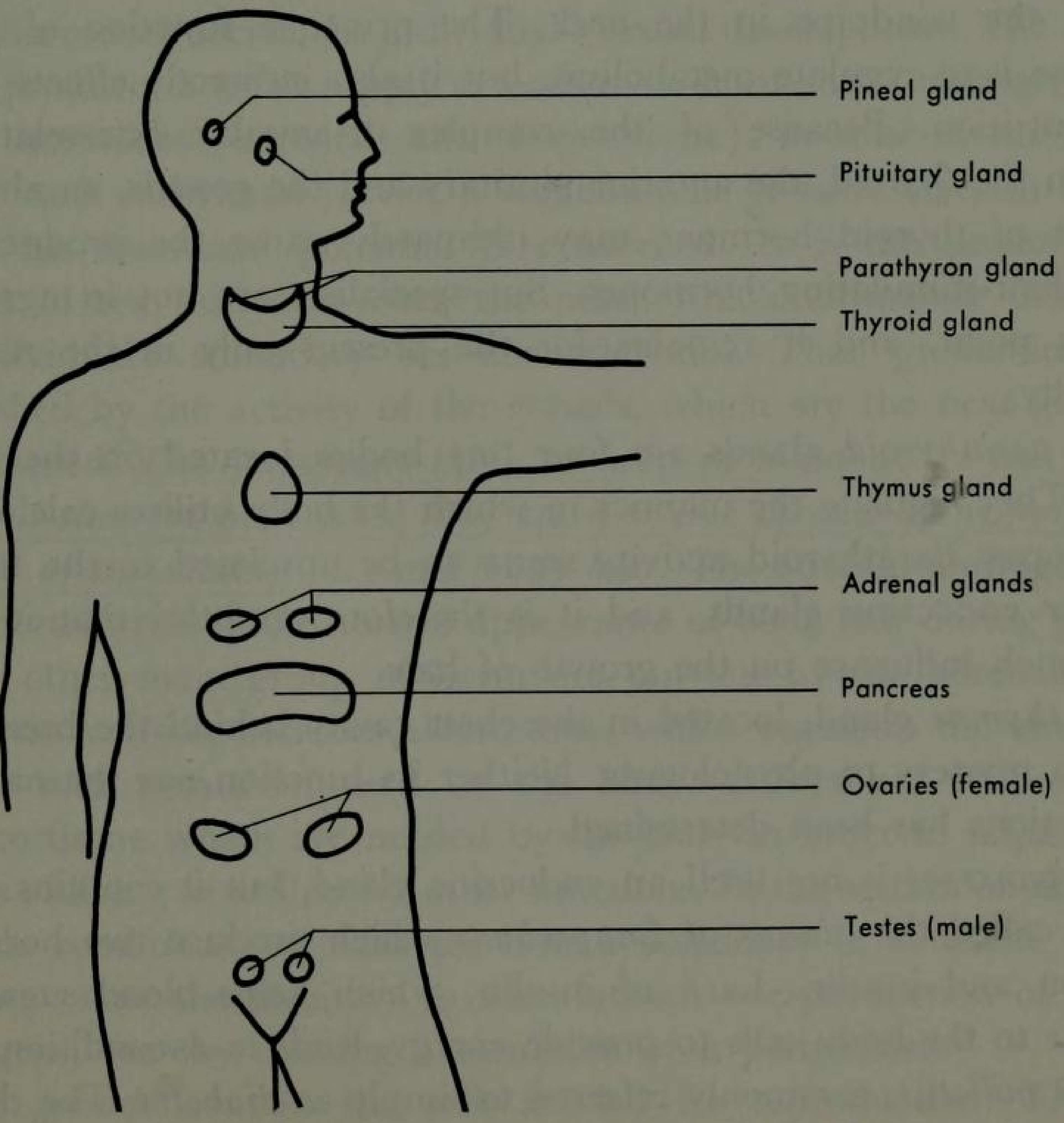

FIGURE 1. *Location of the Endocrine Glands.*

lobe releases two hormones, one which is influential in certain processes connected with childbirth and another which helps prevent loss of water from the kidneys. The *intermediate* lobe puts out a hormone which brings about a deepening of skin pigment.

We have noted that the *anterior* lobe of the pituitary is called the "master gland" because of the way some of its hormones control the activities of other endocrine glands. In addition, another of its hormones regulates the growth of the entire body. When the anterior lobe ceases to function, growth and development of the body are severely impaired.

Among the various regulating hormones of the anterior lobe are the *gonadotrophins*, which regulate the development and function of the gonads (sex glands), *thyrotropin*, which regulates the activity of the thyroid gland, and *adrenocorticotropic hormone* (ACTH) which controls the functioning of the adrenal cortex. Since the adrenal cortex and the sex glands are both sources of hair-stimulating hormones, the "master" gland has an indirect effect on hair growth through its control over these other glands. *An excess of pituitary hormones has been known to result in superfluous hair.*

The *thyroid* gland consists of two lobes which are located on either side of the windpipe in the neck. The principle function of thyroid hormone is to regulate metabolism, but it also indirectly effects growth and nutrition. Because of the complex triangular interrelationship between the thyroid, the anterior pituitary and the gonads, an abnormal amount of thyroid hormone may ultimately cause the production of excess hair-stimulating hormones. But specialists are not in agreement on this point, and it remains for the present only in the realm of possibility.

The *parathyroid* glands are four tiny bodies located on the thyroid gland. They regulate the manner in which the body utilizes calcium and phosphorus. Parathyroid activity seems to be unrelated to the function of other endocrine glands, and it is therefore doubtful that it would have much influence on the growth of hair.

The *thymus* gland, located in the chest cavity behind the breastbone, is still a mystery to physiologists. Neither its function nor the nature of its secretions has been determined.

The *pancreas* is not itself an endocrine gland, but it contains groups of cells called the *islands of Langerhans* which produce two hormones, glucagon and insulin. Lack of insulin, which helps blood sugar gain entrance to the body cells to provide energy, leads to a condition called *diabetes milletus*, commonly referred to simply as *diabetes*. The diabetic poses special treatment problems to the electrologist.

The *adrenal glands,* also called *supra-renals,* are situated one above each kidney. There are two parts to an adrenal gland: the *medulla,* or core, and the *cortex,* or outer portion. The medulla produces *adrenalin* and *epinephrine,* which are released into the circulation system the moment a person becomes frightened, angry, or very excited. These hormones are instrumental in preparing the body for fight or flight, by enhancing all of those activities which will give it energy and strength.

The adrenal cortex produces hormones called *steroids,* which are of such vital importance that one would not be able to survive without them. Although there are more than thirty known steroids, they can be grouped as follows:

1. Sex hormones
    - (a) androgens (male)
    - (b) estrogens (female)
    - (c) progesterone (female)
2. Corticosteroids
    - (a) glucocorticoids
    - (b) mineralocorticoids

Sex hormones decide the individual's sexual development. The adrenal cortex produces a small supply of both male hormones (androgens) and female hormones (estrogens and progesterone). Because of the adrenal cortex, each individual carries a combination of both sexes in him, so far as his hormonal potential is concerned. It is the predominance one set of sex hormones over the other which ultimately determines an individual's secondary sex characteristics. That predominance is established by the activity of the gonads, which are the next glands to be discussed. *The important thing to keep in mind about the adrenal glands is that for both sexes they are a source of androgens, which are capable of stimulating face and body hair.* The adrenal androgens play an important role in the normal appearance of body hair during puberty.

The other main group of hormones put out by the adrenal cortex, the corticosteroids, includes alderostone, which regulates the amount of sodium and potassium used by the body. Others are *cortisone* and hydrocortisone which are needed by the body in order to adjust to the stresses of living as well as for other functions. In the section on abnormal systemic conditions, we shall see how a deficiency in cortisone production can cause the pituitary to stimulate an overproduction of adrenal androgens, thereby creating a condition of hypertrichosis.

The *gonads* contain the cells needed for reproduction. They also produce certain steroids similar to those produced by the adrenal cortex.

The male *testes* are known to produce the all-important androgens. However, some estrogens have also been found in this gland.

The most potent androgen produced by the testes is called *testosterone*. Testosterone is the cause of physical changes during puberty such as the growth of the beard, the deepening of the voice and the enlarging of the genitalia. These are regarded as secondary sex characteristics because they are subsequent to the primary sexual organs with which males are born. Loss or malfunction of the testes prior to puberty will leave the individual without masculine characteristics. In the seventeenth century the Italians made a practice of castrating their more promising choir boys so that the latter could retain their high soprano voices as adults.

The *ovaries*, which are the female counterparts of the male testes, direct the reproductive life of woman. First, they produce the female sex cell, the ovum. Secondly, they secrete a group of hormones called estrogens, which are instrumental in the fertilization of the ovum by male sperm and which are also responsible for the emergence of secondary female characteristics. Thirdly, the ovaries manufacture other hormones such as progesterone and relaxin which are also of importance for reproductive processes.

Like the male sex gland, the ovary has been found at times to be capable of producing hormones similar to those put out by the glands of the opposite sex. There is some speculation that because the male and female glands originate from the same undifferentiated mass of cells in the foetus, the eventual sex differentiation of these glands is not always complete. Thus a small amount of androgen-producing tissue sometimes persists in the ovary. Whether or not this conjecture is true, it is nevertheless widely known that certain ovarian tumors can lead to an unusual output of testosterone-like androgens.

It can now be seen that many glands of the endocrine system can affect the stimulation of body and face hair, either indirectly, as in the case of the pituitary gland or possibly the thyroid, or directly, as in the case of the adrenals or the gonads. *Only the androgens are known to stimulate hair-growth on the face or body directly.* Thus any spontaneous appearance of hair on face or body are ultimately traceable to a systemic imbalance involving an increase in the production of androgens.

It is significant to note here that estrogens do, in an indirect way, effect the level of hair-stimulating androgens produced by the adrenal cortex in women. But this effect occurs only systemically and only through ultimate hormonal control of the activity of the adrenal cortex. As for any direct effect, medical research indicates that the topical administration of estrogen does not in any way reduce the local hair-stimulating effects of androgens; the one hormone cannot *directly* reduce the effects of the other hormone.* [Footnote] These findings demonstrate that methods of "hair removal" which rely on topical estrogen applications are completely worthless. No cosmetologist has legal access to estrogens of sufficient strength to induce an adequate systemic change. Cosmetologists who advertise a treatment which combines waxing with estrogen applications are, in effect, combining two ineffectual methods. The hormones are too weak to have any effect, and the tweezing, as mentioned earlier, tends to strengthen and coarsen the hair, rather than diminish it.

(A) NORMAL SYSTEMIC CHANGES

To understand the way in which glandular alterations can bring about normal growths of hair during such periods as puberty, pregnancy and menopause, we might envision the human body in terms of a master blueprint on which certain special areas have been designated as the site of future hair growth. These "target" areas are exactly the same for men and women. The one factor which saves a woman from the male's typical hairiness is a difference in endocrine structure. Androgens are the only hormones capable of stimulating target follicles to produce hairs, and a woman's system usually produces smaller quantities of these than does a man's. Nevertheless, during puberty, pregnancy or menopause these quantities are apt to increase, inevitably resulting in increased hairiness.

The following are the terms applied to the hair on each section of the body:

Barba—the face.
Capilli—the head.
Cilia—the eyelashes.
Hirci—the armpit.
Pubes—pubic region.
Supercilia—the eyebrows.
Tragi—the ears.
Vibrissae—the nostrils.

The pattern of development for any given individual will vary according to the hormone sensitivity of each area, a sensitivity which is strictly hereditary. Figure 1A shows those areas which are normally sensitive to an excess of androgens. For each individual the pattern will be slightly different, so that we can never predict where an increase in androgens is likely to effect hair growth. Some women develop body hair without any effect to the face. Others may develop lip or chin growths without changes elsewhere. But in all cases of spontaneous growth the change must be triggered by an increase in androgens.

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*Harry J. Hurley and Walter B. Shelley, *The Human Aprocine Sweat Gland in Health and Disease* (Springfield: 1960), pp. 72, 73.

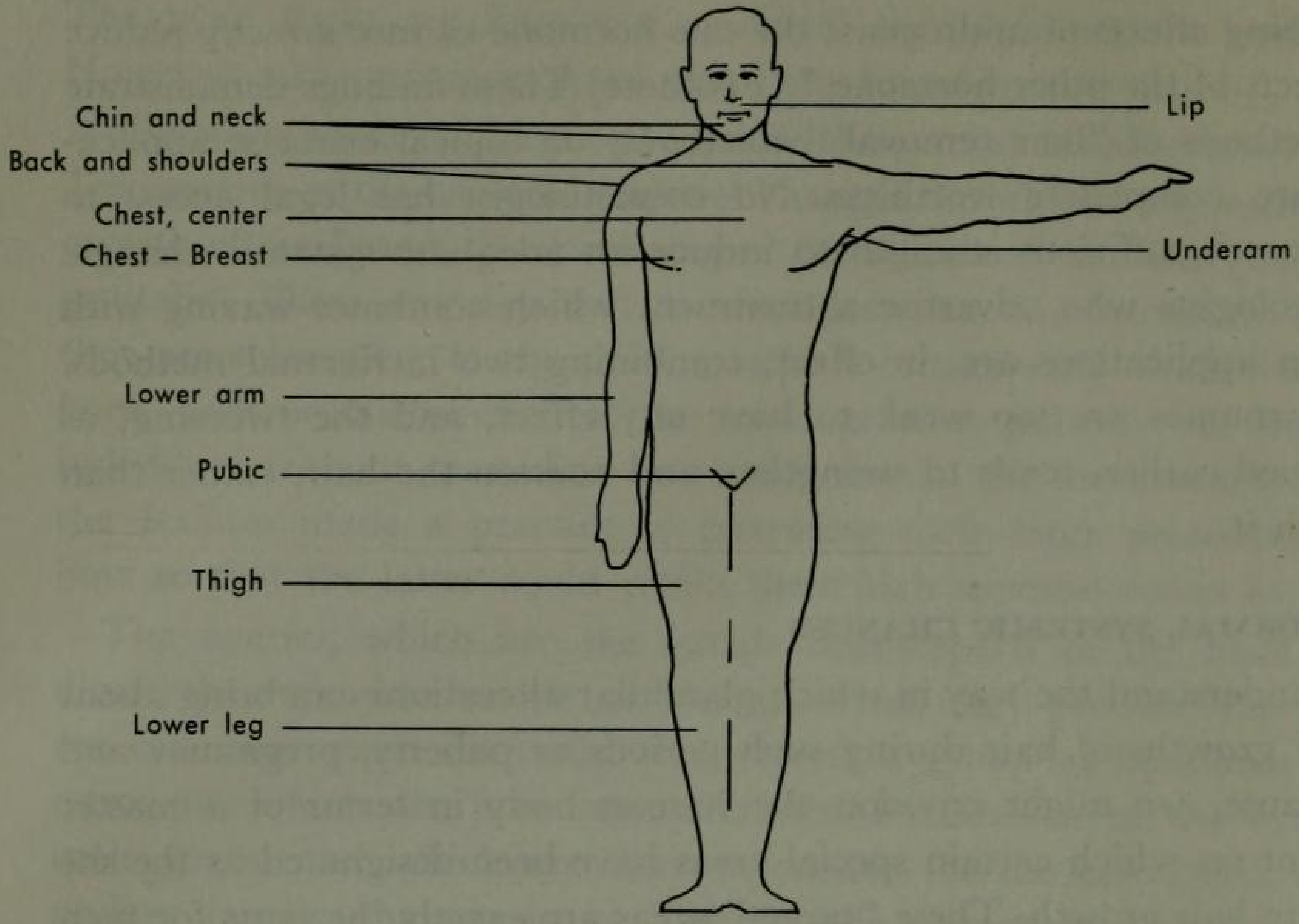

FIGURE 1A. *"Blueprint" of normal "target" area for androgen stimulated hair growth. (Male and female.)*

1) Puberty

One of the first events in that period of life known as puberty is the secretion of certain *gonadotrophic* hormones by the anterior pituitary ("master") gland. The target organs of these gonadotrophins are the gonads, i.e., either the ovaries in woman or the testes in man. In addition, the adrenal cortex is stimulated to action at around the same time. Both these glands, the adrenal cortex and the gonads, are thus encouraged to excrete large quantities of steroid hormones into the circulatory system. In the male, the influence of adrenal hormones on bodily changes is largely overshadowed by the action of the testicular hormones. In the female, we find the female estrogens produced by the ovaries working in conjunction with the male androgens from the adrenal cortex to create secondary sex characteristics.

Of special interest to the electrologist are the specific changes in hair growth resulting from increased amounts of androgen during puberty. In women the increase in adrenocortical androgens is responsible for the appearance of pubic and axillary hair. The appearance of hair in other regions apparently depends on both the woman's hereditary sensitivity to androgens and the amount of androgens produced.

In men the adrenocortical androgens control the appearance of pubic and axillary hair, but testostrone, the principal hormone of the testes, is responsible for all other hair patterns. For example, even though pubic hair is generally stimulated by adrenocortical androgens, the characteristic linear extension of the male pubic hair towards the umbilicus is due to the action of the testosterone. Testosterone also influences the growth of the beard, converting the soft down of the boy into the man's wiry bristles. Hair on the trunk and limbs is another result of testosterone influence. One perhaps unfortunate effect of testosterone is the recession of the male hair-line, generally beginning in the third decade in cases where there is an inherited propensity to baldness.

The usual hair problems which accompany a normal puberty involve accelerated lanugo hairs which may appear on the face or on portions of the body which are normal target areas. These long hairs may in many young girls reflect a simple temporary imbalance, the coordination of the adrenals and the ovaries not necessarily having been established immediately. It is not necessary to treat such hairs unless they become terminal hairs, since it is probable that they will subside once a balance is established. Only in cases of extreme anxiety about appearance is there any necessity for treating adolescents. Tweezing should definitely be discouraged for it will eventually lead to those scattered coarse hairs found in many older women.

2) *Pregnancy*

Pregnancy is a time of unusual endocrine activity during which time it is not unusual for an excess of androgens to be produced. Often a growth will appear on the upper lip, chin and sides of the face of a woman in pregnancy. Seldom, however, do these become terminal hairs. Not long after the woman has given birth the endocrine balance is restored and the recalcitrant crop disappears. Treatment is therefore unnecessary.

3) *Menopause*

Menopause marks the end of a woman's reproductive life and is a gradual, yet radical change which takes place over a period of years, usually beginning at around 40 years of age. Menopause is a time of great stress for most women; and the emergence of a new crop of hair is hardly a comforting addition to the problems menopause often brings. The basic cause of this change is a decline in the secretion of estrogens by the ovaries. Unfortunately, excessive hair is a frequent accompaniment of menopause, owing to a failure of the ovaries to produce sufficient hormone. Since hormones produced by the ovaries have an inhibiting or restraining affect on the anterior pituitary, lack of estrogen means lack of proper control over this master gland, which then begins to pour out a flood of stimulating hormones. This results in a hyperstimulation by pituitary hormones of the adrenal cortex which in turn produces, among other things, an excess of hair-producing androgens. Thus we often find women whose ovary activity is declining (usually after age thirty five) developing facial and body hair.

At the beginning of a woman's change of life, she may acquire accelerated lanugo hairs and a few bristles. Often the chin hairs increase one by one over a period of years until pseudo-tufts of heavy dark hairs are formed, especially on both sides of the chin.

The majority of the electrologist's clients will be women in or beyond their "change-of-life" period. It is to these women that the electrologist can be of greatest service since many of the hairs developed during this period are of a permanent nature. It is important to realize, however, that in treating these clients the electrologist accomplishes nothing by removing infinitesimal lanugo hairs. Only a small percentage would ever become terminal hairs, and treating them would only create a needless expense to the patron. The electrologist should concern herself with only those hairs which have already become accelerated lanugo or terminal hairs. If treatment is begun late in menopause or after the change-over is complete, one seldom finds any heavy new growths of terminal hair, just an occasional appearance of scattered bristles.

(B) ABNORMAL SYSTEMIC CHANGES

Sometimes an endocrine imbalance will result from unnatural circumstances. Often, this involves a pathological disorder which requires immediate treatment by a qualified physician or endocrinologist. The electrologist must be prepared to recognize these disorders in order to counsel prospective clients wisely. In such cases hypertrichosis must first be treated through correction of the underlying cause, i.e., the glandular imbalance itself. Then, once medical treatment has been started, the electrologist may deal directly with the hair problem.

The wisest advice an electrologist can give to a client suffering from an endocrine disorder is that he or she report to a specialist as quickly as possible. *Do not attempt to diagnose the patron's problem yourself.* A thorough examination by a licensed qualified specialist is the only sure method of determining the true nature of a patron's problem. As a matter of policy, you should refuse to treat any patron who manifests such pathological symptoms until the patron has visited a specialist and received permission to proceed with electrology treatment.

1) Pathological Changes

The outline of abnormal endocrine conditions offered below should be used merely as a guide for detecting pathological conditions. The term "pathological" is intended here to indicate those disorders which involve some form of disease; they are not the result of surgery, medication or emotional circumstances, each of which causes will be discussed separately. Pathological endocrine disorders arise out of (1) a glandular defect inherited from either parent, (2) an acquired disease or infection, (3) a tumor, or (4) a dietary deficiency. Listed below are several common pathological disorders which result in hypertrichosis.

Cushing's Syndrome. A syndrome is a group of symptoms and signs, which, when considered together, characterize a disease or lesion. Cushing's syndrome involves a collection of symptoms brought on by a prolonged excess of adrenocortical hormones, among which are included adrenocortical androgens. Hirsutism is one of its signs.

Cushing's syndrome is characterized by rapidly developing obesity of the face, neck and trunk, whereas the arms and legs are unaffected. Subjects become round shouldered. Women cease to menstruate. Skin is dusky, acquires purplish lines, and bruises easily. Backache and abdominal pain are also very common.

There are many possible causes of Cushing's syndrome: excessive cell development (hyperplasia) of the adrenal cortex, tumors of the cortex, certain tumors (adenoma) of the pituitary, or prolonged medication with doses of adrenocorticotropic hormone (ACTH), cortisone or hydrocortisone—in short, any kind of condition which will cause the adrenal cortex to produce excessive amounts of hormones, including androgens.

Adrenogenital Syndrome. This syndrome, which is somewhat rare, arises when the adrenal cortex becomes unable to utilize the chemical materials needed for manufacturing cortisones. Instead it transforms them into androgens. Since the pituitary puts out adrenal-stimulating hormones in proportion to the amount of cortisone circulating in the system, the lack of cortisone causes it to encourage the cortex to work even harder. But all the cortex can produce is androgens, which it secretes in even larger quantities.

When this condition exists in the foetus it produces a "false hermaphroditism" in girls, wherein they retain their ovaries but the external genitalia tends toward masculine development. In childhood boys become precociously developed sexually, acquiring all of the secondary characteristics associated with puberty. Little girls may develop a beard and moustache, a deep voice, and an athletic muscular development, as well as other male secondary sex characteristics. This condition, as it appears in childhood or in its less extreme form in adulthood, is often referred to as *adrenal virilism*, a term which would apply equally well to the masculine traits emerging out of Cushing's syndrome.

The causes of the adrenocortical syndrome usually involve an abnormality of the adrenal cortex, such as a tumor.

Archard-Thiers Syndrome. Diabetes of bearded women, as it is sometimes called, is a rare condition in which features of the adrenogenital and Cushing's syndrome are combined.

Stein-Leventhal Syndrome. This disease is characterized by lack of menstruation and/or abnormal uterine bleeding, frequent hursutism, and occasional obesity and retarded breast development. The ovaries are found to contain multiple cysts, which are possibly the cause of the disorder.

Acromegaly. Excessive pituitary hormones, when they are produced by the anterior pituitary gland early in life, lead to gigantism, which is a disease marked by the rapid growth of the body to extremely large proportions. If, however, the excess hormones do not begin to flow until the body has so matured that it is not capable of further symmetrical development, the abnormal growth occurs in the form of acromegaly. At that time only those portions of the body capable of responding to the hormone continue to develop.

Acromegaly is characterized by the coarsening of the features, due to the continued growth of tissue. Hands, feet and face show the greatest change. The enlargement gives rise to pressure symptoms in many areas. Defective vision and even blindness may result. Besides the effect on growth, many secondary changes in the function of other glands occur as the result of this disease of the master gland. Included among these changes is the production of androgens, which in many men and women results in extensive hypertrichosis, including heavy face and lip growth.

The cause of acromegaly is usually a tumerous growth of the pituitary.

There are other endocrine conditions besides those listed above believed to be responsible for hypertrichosis. However, many of them are controversial. For example, both *hypothyroidism* and *hyperthyroidism* have been indicated at various times as the cause of hirsutism. But some specialists deny that this can be the case. The problem involved here, as in so many cases of glandular disorder, is the sheer complexity of the endocrine interrelationships. The thyroid problem may only be the result of some other problem, which itself is stimulating excess androgens. Much more research in endocrinology is needed to discover the full range of possible endocrine relationships capable of causing hypertrichosis.

2) *Surgical Changes*

The surgical removal of the sex glands (ovarectomy or oophorectomy) in women after puberty brings about an artificial menopause. Menstruation ceases and sterility ensues. Because the normal control that estrogens have on the adrenal cortex is removed, androgens become produced in greater quantities. The frequent result is a face growth suggestive of that of the young male.

3) *Medicinal Changes*

Because of the subtlety of the endocrine balance, the taking of any hormonal medication may possibly lead to an abnormal growth of hair. Scarcely a drug of this kind is manufactured without a warning on the label that hirsutism may ensue. Cortisone, for example, is a common cause of the problem (Cushing's syndrome). Birth control pills also have had extraordinary effects on certain women. Some women, for example, who have tended to have excess lanugo hair lose it after using birth control drugs for a short time. Other women who had no problem suddenly blossom forth after using birth control pills. Because each person has her own unique chemistry there is no way to predict her reaction to such drugs. Ordinarily a hair condition will spontaneously return to normal when one ceases taking medication, *if the growth has not been stimulated to the terminal-hair stage.*

4) *Emotional Changes*

One last abnormal systemic cause of excess hair must be mentioned, if only to make this outline of causes complete. It has been found that people under stress often develop heavier growths of hair than they would under normal conditions. Women in concentration camps during World War II manifested unusual hirsutism as the result of emotional crisis. This arises from the fact that the adrenal glands are highly active during crisis, in order to produce large amount of adrenalin. The heightened activity of the adrenal glands results in unusual quantities of hair-causing cortical androgens. Abnormal adrenal activity over a sustained period of time would thus lead to an excess of hair in the target areas. This is not, however, a problem that confronts the electrologist very often.

Summary

We have seen that unwanted hair can be caused in many ways, generally classifiable as congenital, topical or systemic. Systemic changes are, by far, the most frequent reason for visits to the electrologist. For this reason, if for no other, you should become well acquainted with the symptoms of chronic glandular disorder.

Ask the patron who shows signs of glandular imbalance whether she has been taking hormone preparations of some kind and whether her system is functioning properly. If her answers to these questions indicate serious disorder, suggest that she discuss it with her own doctor. You must be satisfied that the causes of a hair problem are under proper care, if you expect to rectify the effects.

Chapter II

Structure and Dynamics of Hair and Skin

The life and death of the human hair is a tale of little interest to ordinary mortals. But to the electrologist, who often plays a principal part in this microscopic drama, knowledge of the hair's life cycle is vital to success. As executioner, she must destroy those renegade hairs which mar the countryside with their prickly presence, and to do so she must fully understand the hidden mechanisms which aid and abet them. This chapter is intended as an over-all blueprint of the architecture and activity of hair with special attention to those features which concern the electrologist.

Because our purpose is primarily practical, the theoretical content of this chapter will be limited to those aspects of hair growth which are of immediate importance to the electrologist. The chapter has been divided into two sections. The first section provides a bare background of theoretical information to equip the student for state board examinations and to give her a general understanding of the structure and function of the *tegument* (the skin and its appendages). The second section offers a technical analysis of the intricate structure of the hair follicle and the details of its development. This knowledge is important for an understanding of the theory of permanent hair removal. An appendix has been added to illustrate actual variations in follicle structures as they occur in the human skin.

SECTION ONE: GENERAL THEORY

Skin Structure

Skin is an elastic, flexible membrane covering some fourteen square feet on the average person. It is thinnest on the lips and eyelids, while on the much-used palms and soles, it is at its thickest. Friction and pressure tend to increase the thickness of skin and exposure toughens it. Cold contracts it; warmth relaxes it.

Function Of Skin

As the largest of the organs of the body, the skin is more than a mere covering. The following are the six primary functions of the skin:

1. **Heat regulation.** To maintain the normal body temperatures of 98.6°, the skin "sweats" by producing moisture through secretions of the sudoriferous glands. The evaporation of this moisture has a cooling effect on the body.
2. **Absorption.** Because of the oily particles in the epidermis the skin will absorb oily substances without admitting any water substances. Certain drugs may therefore be applied topically.
3. **Excretion.** The sebaceous glands excrete sebum, an oily substance which helps to maintain the skin in a healthy condition.
4. **Protection.** The fat cells provide protection against hard blows to the body. The malpighian layer (stratum malpighii) protects against the harmful effects of light. The outer, horny layers form a protection against the invasion of bacteria, as well as the wear and tear of abrasion.
5. **Elimination.** By the process of perspiration, the sudoriferous glands secrete waste materials.
6. **Sensation.** Nerve endings in skin allow us to detect heat, cold, touch, pleasure, pressure and pain.

Stratification Of Skin

The skin is stratified into many layers, but most anatomists have found it convenient to discuss it in terms of three major subdivisions. At the surface we find the *epidermis*, also referred to as the cuticle or "scarf skin." Next comes the *dermis*, also called the derma, cutis, corium or true skin. Finally we encounter the deepest layer, the *subcutis*, which is often

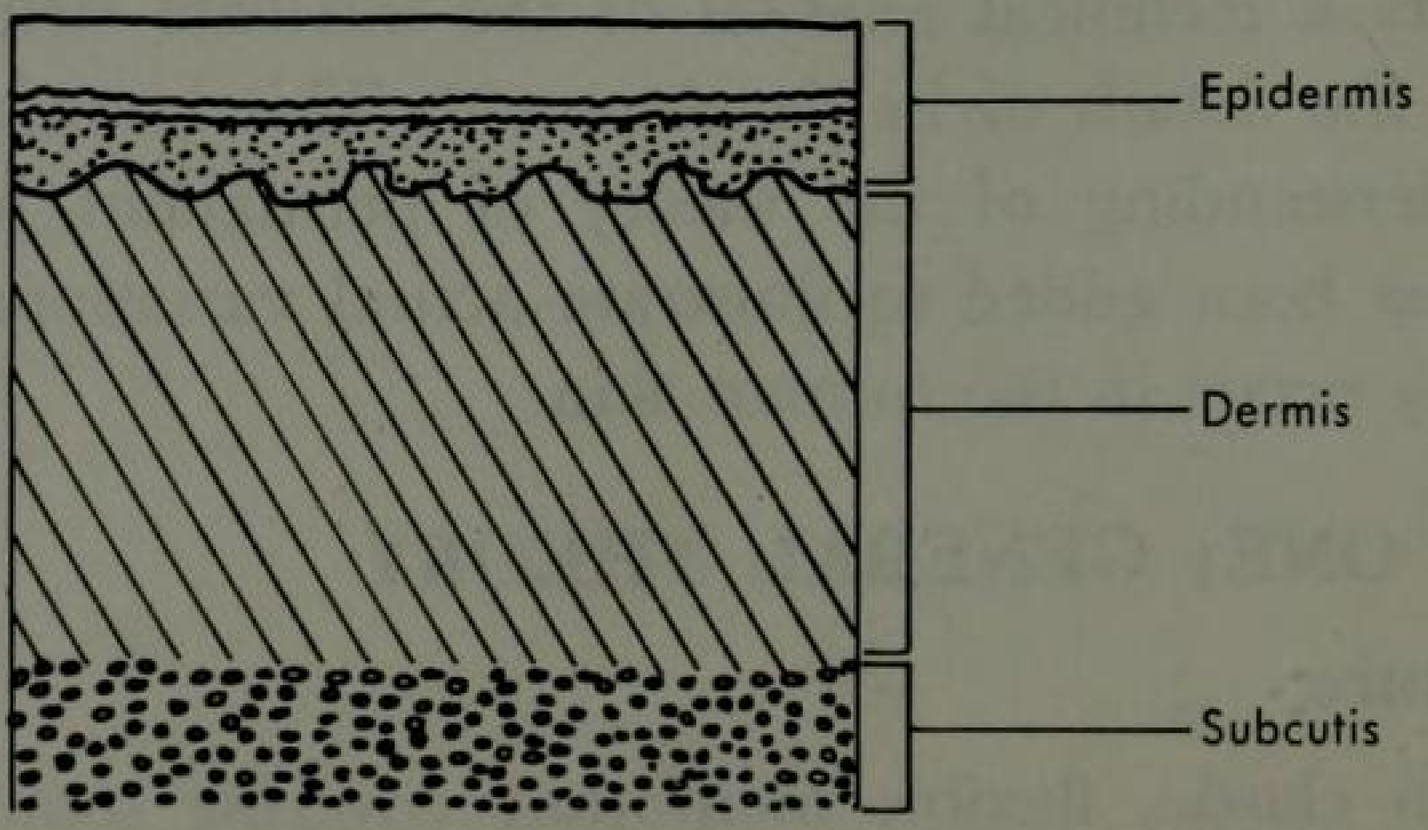

Figure 2. *Layers of skin.*

called the subcutaneous or adipose layer. Some anatomists regard the subcutis as a continuation of the dermis.

EPIDERMIS

The *epidermis* consists of *stratified squamis epithelium* which form the protective covering of the true skin; *squamis* meaning made up of flattened cells, *epithelium* meaning a cellular substance of skin. All such cells are produced by a process called *mitosis* whereby certain cells continually divide into halves which grow into full-size cells.

Physiologists are not unanimous in defining or distinguishing the layers within the epidermis, but it will suffice for our purpose to regard the epidermis as containing four principal layers:

1. **Stratum Corneum**—the horny outer layer which constantly sheds its dead cells.
2. **Stratum Lucidum**—somewhat less horny than the corneum.
3. **Stratum Granulosum**—a layer of cells containing granules.

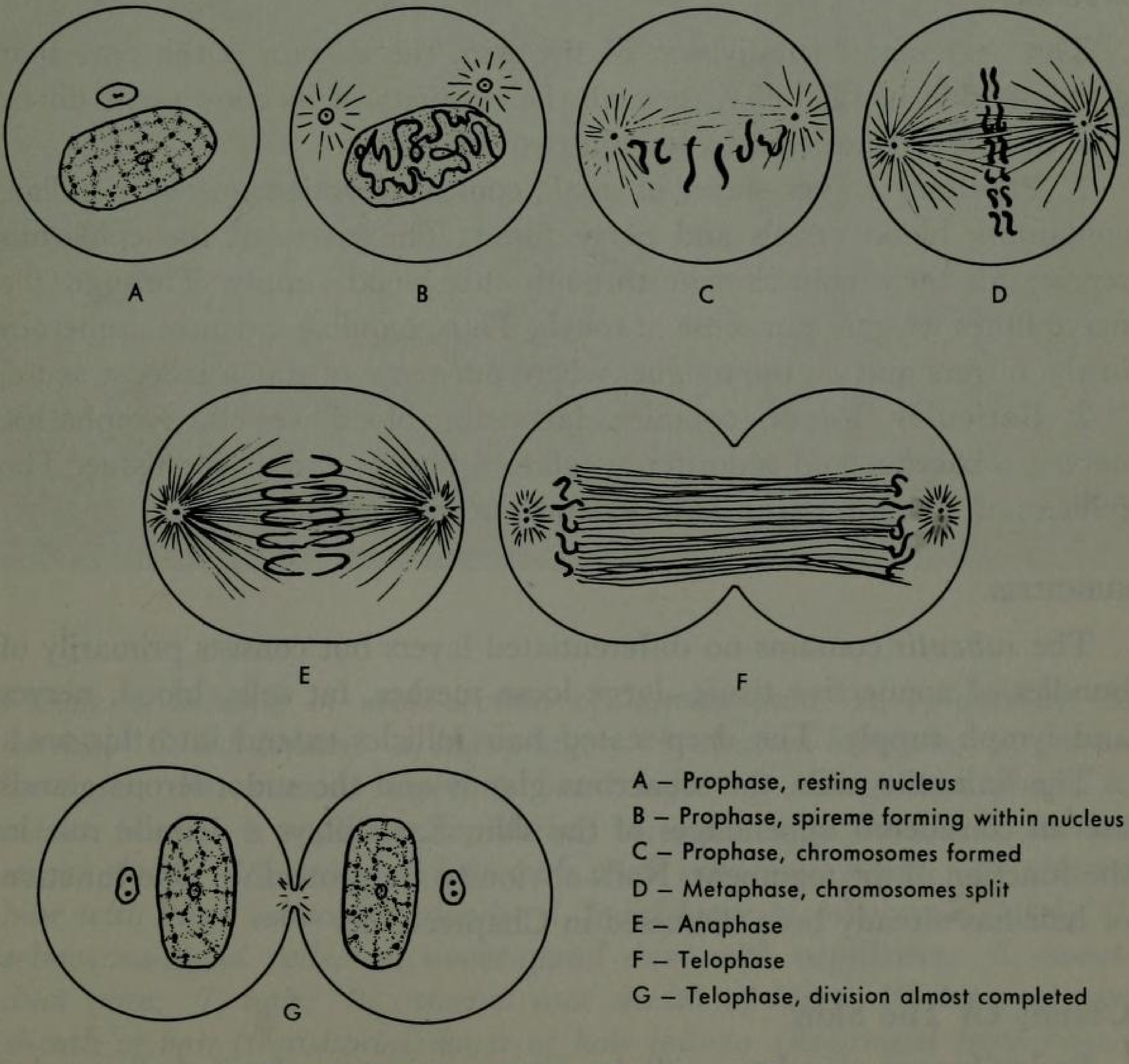
A
B
C
D
E
F
G
A – Prophase, resting nucleus
B – Prophase, spireme forming within nucleus
C – Prophase, chromosomes formed
D – Metaphase, chromosomes split
E – Anaphase
F – Telophase
G – Telophase, division almost completed

FIGURE 3. *Stages of mitosis or cell division.*

4. **Stratum Malpighii**—the layer containing the pigment which determines the color of one's skin. This layer has also been called the mucous layer or stratum mucosum.

According to Montagna, the *stratum germinativum* is a single layer of cells which underlies and is considered a part of the *stratum malpighii.* The germinative cells of this layer produce all the other cells of the epidermis through the process of simple cell division (mitosis). The cells which are thus produced at first become "prickle cells," which constitute the stratum spinosum, the upper portion of the stratum malpighii. The prickle cells are themselves known to be capable of mitotic activity, especially in the lower third of their stratum. This merely indicates that the activity and structure of epidermal cells alter gradually in their upward development, rather than abruptly. These cells become flattened and lose their moisture as they rise to the surface, thus becoming a part of each stratum in turn, until they finally slough off as horny cells of the stratum corneum.

DERMIS

The next major subdivision of the skin, the *dermis,* is the part that gives the skin its pliability, through the elasticity of its constituent fibres. The dermis is considered to contain two sub-layers:

1. **Papillary Layer**—layer of small, conical elevations, called papillae, containing blood vessels and nerve fibres. The layers of the epidermis receive all their nourishment through this blood supply. Through the nerve fibres we gain our sense of touch. Thus, papillae are most numerous in the fingers and on the tongue, where our sense of touch is most acute.
2. **Reticular Layer**—contains fat cells, blood vessels, lymphatics, nerves, sebaceous and sudoriferous glands, fibrous and elastic tissue. The follicles of medium depth hairs extend into this region.

SUBCUTIS

The *subcutis* contains no differentiated layers but consists primarily of bundles of connective tissue—large loose meshes, fat cells, blood, nerves and lymph supply. The deep-seated hair follicles extend into this area.

The hair, the nails, the sebaceous glands and the sudoriferous glands are all considered appendages of the skin. Each plays a definite role in the function of the tegument. Nails obviously are protective. The function of hair has already been discussed in Chapter One.

Glands Of The Skin

Sudoriferous glands are tubular organs consisting of coiled glomerulus (see fig. 4) from which extend an excretory duct which opens at the skin surface to form a pore. Sudoriferous glands are abundant over the entire body but are predominant in the armpits, on the forehead, the palms of hands and soles of feet. They perform two functions:

1. They eliminate waste materials through perspiration.
2. They control body temperature by the evaporation of perspiration.

We secrete about one quart of perspiration every 24 hours, but this rate will be increased by high temperature and humidity, exercise, drugs, excitement, nausea, nervousness, pain or disease.

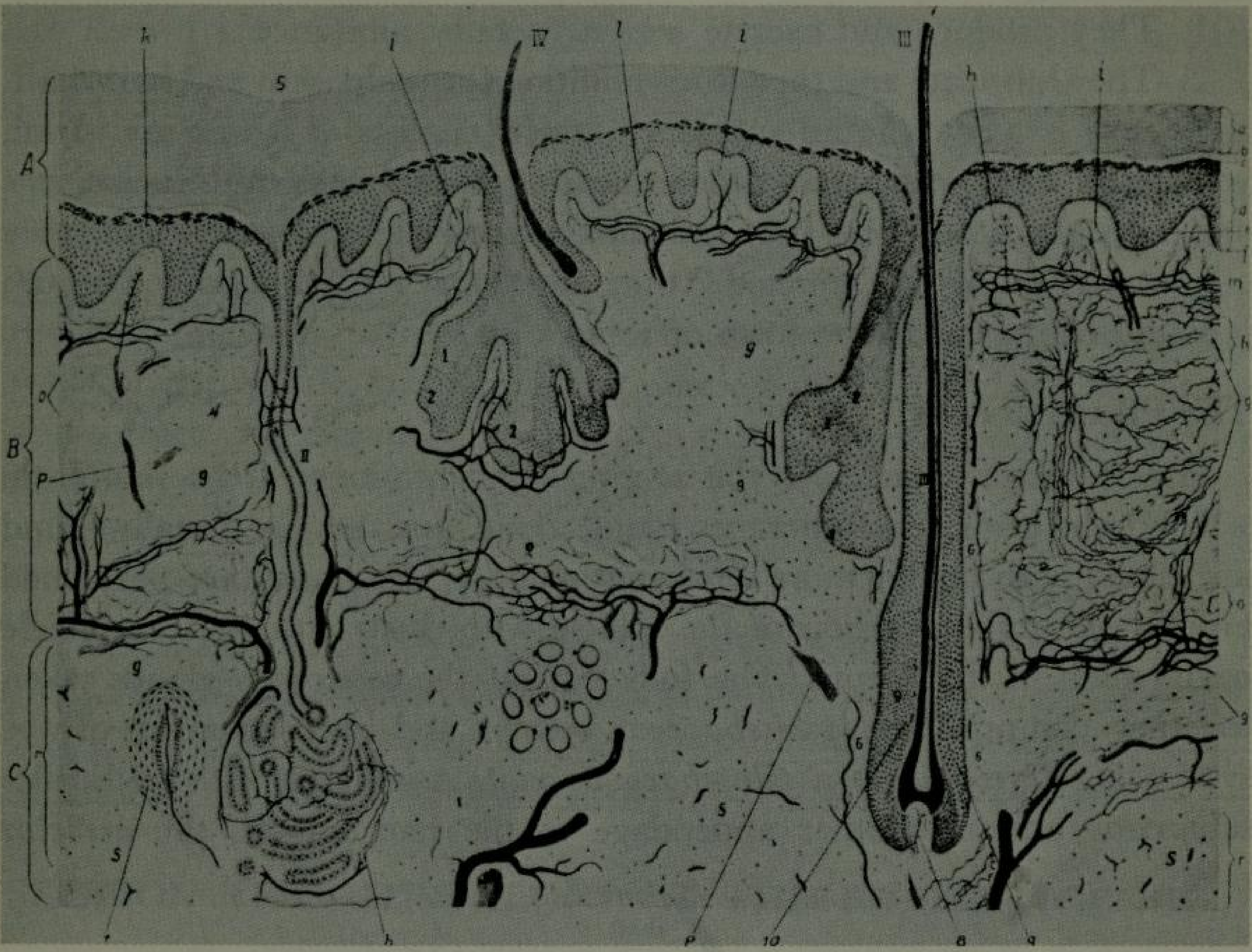

FIGURE 4. *Scheme of cross-section of human skin. A, epidermis; B, dermis; C, subdermis; a, horny layer; b, stratum lucidum; c, granular layer; d-e, mucous layer; f, basal layer; g, collagenous fibers; h, elastic fibers; i, papillary capillaries; I, sebaceous gland; II, eccrine sweat gland; III, terminal hair with small sebaceous gland; IV, downy hair with large sebaceous gland; 1, basal layer of sebaceous gland; 2, sebaceous-gland cells; 4, sweat-gland duct with capillaries; 5, sweat-duct pore; 7, hair; 9, external root sheath of hair; 10, internal root sheath of hair (transitorial) layer of hair follicle. (Reprinted from Physiology and Biochemistry of the Skin by Stephen Rothman, M.D., by permission of the University of Chicago Press.)*

Sebaceous glands are of particular interest to the electrologist because lanugo hairs always begin their growth in a lobe of the sebaceous gland. Much more will be said of these glands at a later time; it suffices for now to give only a brief explanation of their function. These glands are located in the dermis on every part of the body except the palms and the soles. They are most numerous in the face. Although sebaceous glands are the source of new hairs, they are not always associated with hair follicles for there exist many sebaceous glands which have not been stimulated to produce hairs, as, for example, those highly active glands in the regions along the sides of the nose. The activity of the sebaceous glands performs the following:

1. They produce and excrete *sebum* (a fatty substance).
2. They lubricate and therefore condition the scalp, skin and hair shaft.

Sebum is a semi-liquid substance which consists of a mixture of oil, water and such waste materials as dead epithelial cells, fatty acids, fats and salts. Because these materials are a product of degeneration, they cannot be said to be "secreted," they are "excreted." A modified sebum is found in the ear in the form of wax.

The Pilosebaceous Unit

Hair follicles, which are the pore-like indentations of the skin from which hairs grow, are sometimes found alone, but they are usually found associated with one or more sebaceous glands. The glands are positioned around the upper portion of the follicle with ducts entering the follicle cavity high in the dermis. The follicles and the sebaceous glands taken together comprise the *pilosebaceous system* and each member of the system is referred to as a *pilosebaceous unit.* Associated with each pilosebaceous unit is another appendage to the hair follicle, the *arrector*

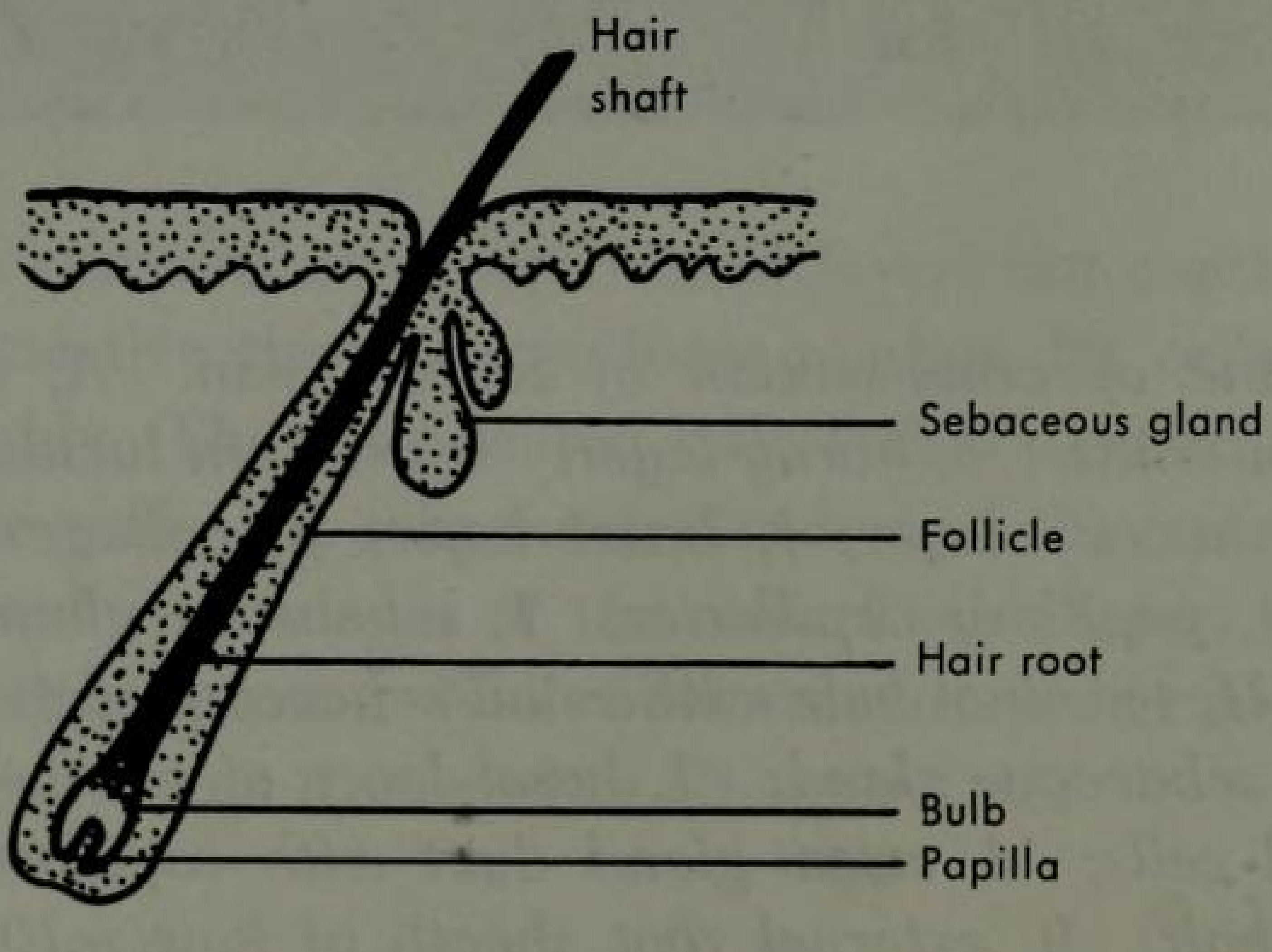

FIGURE 5. *The pilosebaceous unit consists of the follicle and sebaceous glands.*

pilorum. This involuntary muscle is attached at an angle to the base of the follicle. The follicle itself usually approaches the surface at a slant, but when the arrector contracts, either from cold or fright, the follicle and hair are pulled up straight, causing the texture of the skin to take on the appearance of "gooseflesh." These muscles are especially well-developed in dogs and cats, whose hair will stand straight out in moments of stress. Much more will be said about the pilosebaceous units in the second section of this chapter.

Hair

Hairs are *keratinized,* dead structures which no physiological factors are known to influence once they are formed. Keratin itself is a hard horny substance which resists digestion by pepsin (an enzyme) and is insoluble in H_2O, organic solvents, dilute acids and alkalis. Nearly all syntheses in the epidermis seem to be aimed at the production of keratin, which provides a protective toughness for the entire surface of the body. We can understand the nature of hair better, then, when we realize that the hair *follicle* is merely an "indentation" of the epidermis, with the walls of the follicle forming a continuation of the cellular layer of the skin surface. The keratinizing process in the follicle is a specialized version of what goes on throughout the surface epidermis.

The *root* is that portion of the hair which lies in the follicle, whereas the portion above the surface is called the *shaft.* The enlarged base of the root is called the *bulb,* which surrounds a mass of loose connective tissue termed the dermal *papilla.* The papilla contains a blood supply and other elements essential for the growth of hair, but it is not a "part" of the follicle; it is a separate organ which serves the follicle.

SECTION TWO: HISTOLOGY OF THE PILOSEBACEOUS UNIT

Histology is the branch of science dealing with the microscopic study of the structure of tissues. The histology of the follicle and associated organs has particular significance for the electrologist's ultimate purpose—the destruction of those cells and tissues which are responsible for the development of new follicles. 6 We cannot "permanently" remove hairs unless we permanently disable follicle tissue from re-forming. This requires a thorough understanding of follicle structure and development.

Types Of Hair Structures

The structure of a hair is directly associated with its follicle structure. There are really only two general classifications of hair, *lanugo* and *terminal*; all others may be regarded as stages of transition between these two types.

Lanugo (or **vellus**) hairs are the soft, downy type found on the cheeks and elsewhere. They usually lack pigmentation and grow from a shallow depth, having emanated from a lobe of the sebaceous gland. Lanugo hairs do not become terminal hairs unless stimulated by the topical or systemic conditions described in Chapter One.

It is the extent to which the blood supply at the papilla has developed which determines the vigor with which a hair and its follicle will grow. Medical literature is rather vague as to whether or not lanugo hair emanates from a true papilla as does the terminal hair. Most authorities consider lanugo hair as an appendage of the sebaceous gland, receiving its structure and nourishment from the supply available to the sebaceous gland itself. Since it has a very slow growth rate, lanugo hair could have only a rudimentary papilla and matrix from which it develops. These, in turn, must receive their nourishment from the adjacent walls of the sebaceous gland lobes. The *sebaceous lobe containing a lanugo hair, if stimulated by the glandular system or by topical irritation, may grow downward and become the follicle of a terminal hair.* This change-over may take place in gradual steps over a period of from a few months to several years. In the early stages of change this lanugo hair is termed an "accelerated" lanugo hair. This means the hair is longer than its neighbors but has not attained the vigorous growth of a terminal hair and apparently has no bulb. If stimulation should cease, an accelerated lanugo hair will grow no deeper. The replacement hair may even return to the original depth if a permanent papilla failed to develop during the period of stimulation.

When the accelerated lanugo hair begins to develop pigmentation and becomes darker, the root will be deeper than that of non-pigmented accelerated lanugo hair. At this point the bulb shows signs of formation, and with further glandular stimulus this accelerated lanugo hair will make the transition to a shallow terminal hair, having picked up a major blood supply in the dermis.

Lanugo hairs have a shedding and replacement cycle as do terminal hairs. Very little medical research has been reported on lanugo hair growth or replacement rates, but observation indicates they grow slowly, taking two to three months to reappear after tweezing or waxing, and remain dormant six to eight months before shedding.

Terminal hairs are the deep-seated coarse hairs which grow from the scalp, underarms, pubic region and other parts of the body. As distinguished from lanugo hairs, they have a well developed root and bulb,

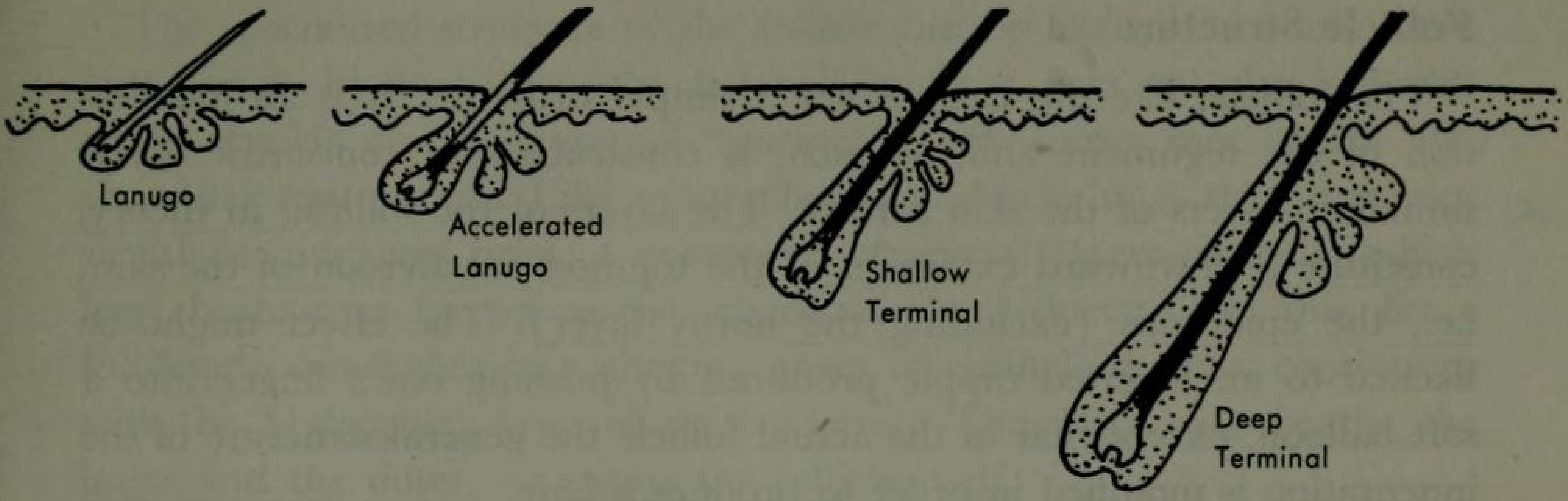

FIGURE 6. *Stages of Transition from Lanugo to Terminal (approximately to scale).*

often growing from a follicle which extends into the subcutis. Fig. 7 presents a fully developed terminal hair. The terminal hair, as distinguished from the simple lanugo hair, is comprised of three concentric layers:

1. **Cuticle.** This is a single layer of imbricated cells (scales) which overlap like shingles leading toward the tip. These contain no pigment. The overlap of these projections interlocks with that of the inner root sheath, anchoring the hair in the follicle. The cuticle serves to confine and protect the cortex and gives the hair its elasticity.

2. **Cortex.** This layer constitutes the mass of most hairs, consists of elongated keratinized cells cemented together. If the hair is pigmented, the pigment (melanin granules) will appear in this layer.

3. **Medulla.** This center section is composed of large loosely-connected keratinized cells. The medulla may be continuous or discontinuous. It may vary within the same hair. These variations in continuity result in air spaces which determine the sheen and color tones of the hair by influencing the reflections of light.

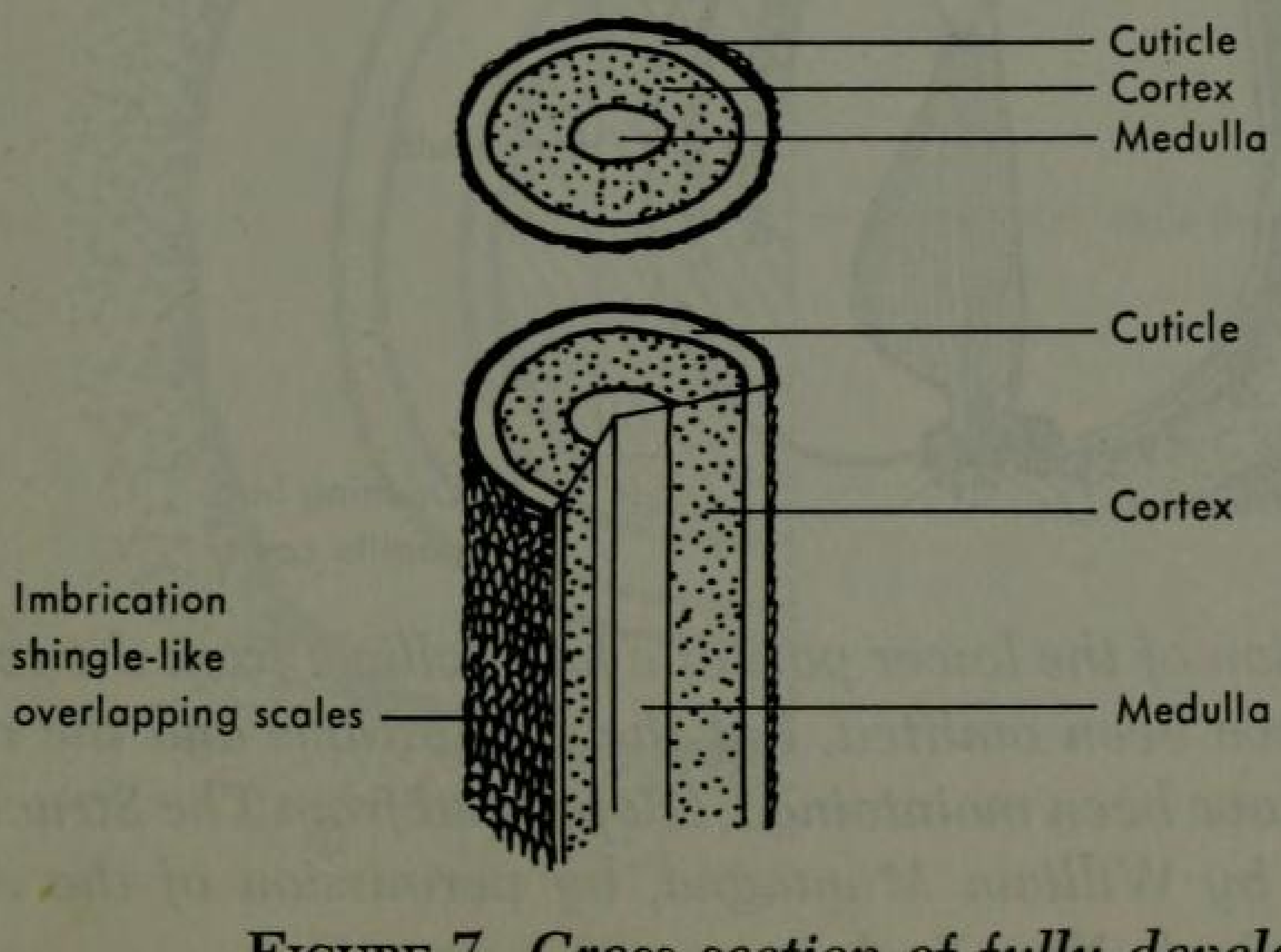

FIGURE 7. *Cross section of fully developed hair.*

Follicle Structure

The follicle, like the hair, is not a simple structure. It is an indentation of the tegument and, as such, is constructed of concentric layers similar to layers of the skin surface. The layers of the follicle, in theory, constitute a downward extension of the topmost subdivision of the skin, i.e., the epidermis (excluding the horny layer). The effect might be likened to an inverted nipple produced by pushing one's finger into a soft balloon, except that in the actual follicle the general structure of the indentation is modified in order to produce a hair.

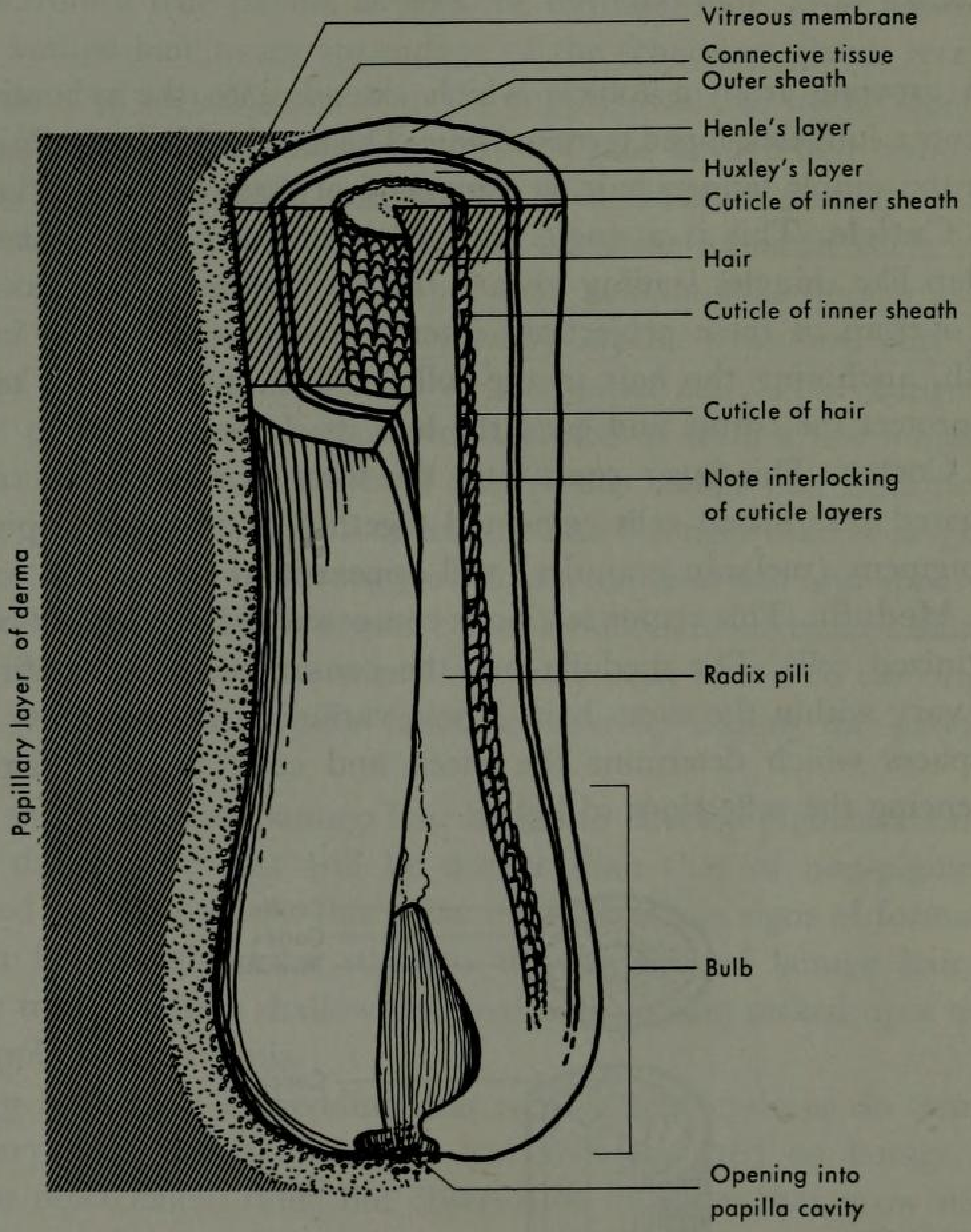

FIGURE 8. *Reconstruction of the lower part of a hair follicle from the scalp. The cellular details have been omitted, but the proportions and the relationships of the layers have been maintained. (Reprinted from The Structure and Function of Skin by William Montagna, by permission of the Academic Press Inc., New York, New York.)*

The specialized structure of the follicle can be likened to a miniature outfit worn by each properly-clad hair when it goes out. Its follicular attire consists of two layers of "garments," *the inner root sheath* and *the outer root sheath.* Like most modern underclothing, the inner root sheath is snug and brief, a composite of several layers of tissue which hug the hair as far up as the sebaceous gland ducts. Over this, fits a full-length outer sheath, a clinging gown of epithelium cells, continuous with the Malpighian layer of the epidermis. These two root sheaths, the inner and the outer, constitute the follicle itself.

It takes more than a follicle, however, to properly outfit any self-respecting hair. A topcoat is also provided in the form of a *connective tissue sheath,* which surrounds the follicle with a loosely-knit mesh of papillary cells, interlaced with nerves and capillaries. All three sheaths, we shall find, are necessary equipment for the "coming out" of a hair.

INNER ROOT SHEATH

The *inner root sheath* encases the hair root in three distinct layers of cells: (1) The *cuticle layer* which interlocks with the cuticle of the hair. (2) *Huxley's layer,* the thickest of the three, and (3) *Henle's layer.* The cellular growth of the inner root sheath originates from the bottom of the follicle at the papilla as does the hair, and both grow upward in unison. At the level of the sebaceous gland the inner root sheath is dis-

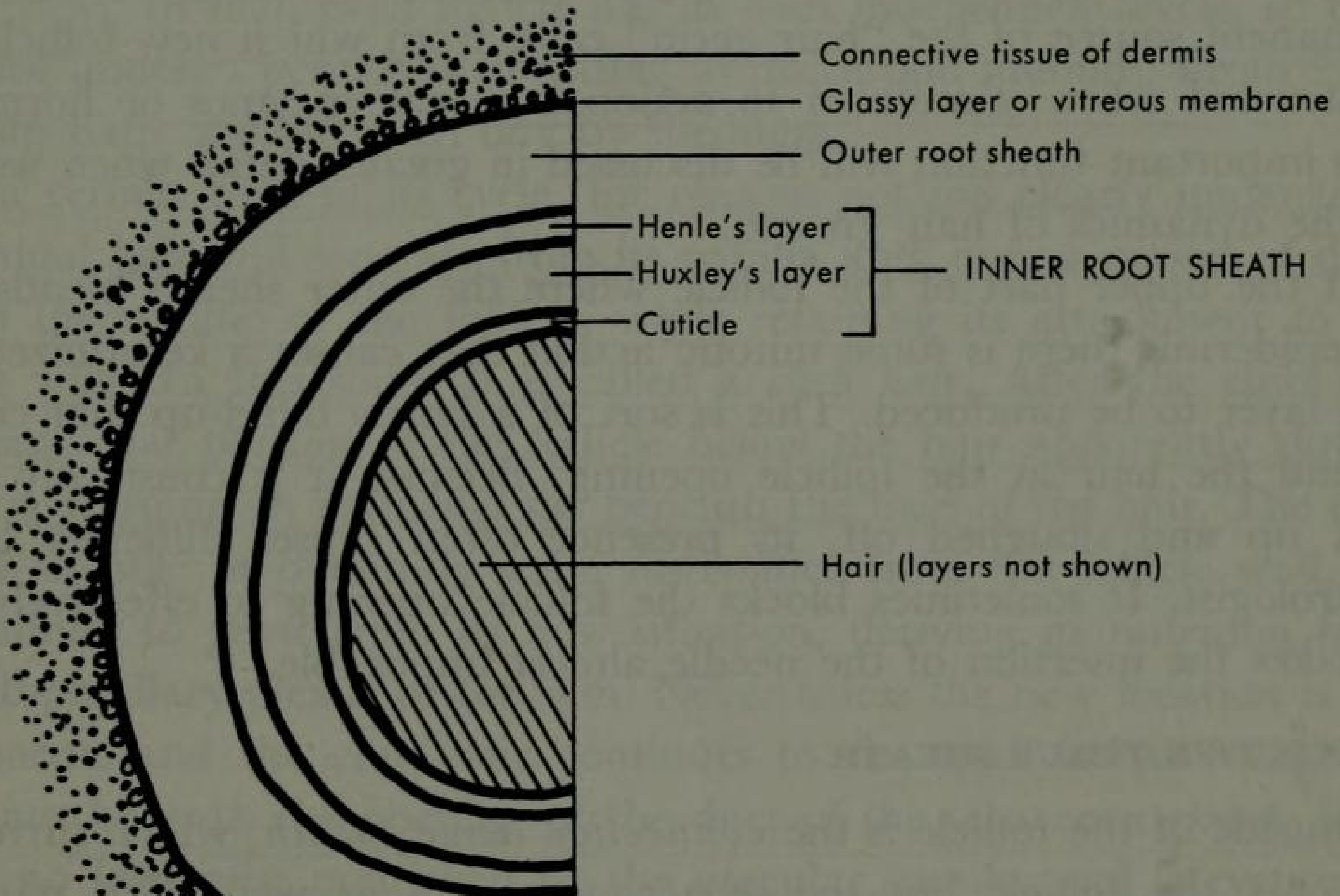

FIGURE 9. *Cross section of hair and follicle.*

solved, reabsorbed or dissipated in some unknown manner allowing the hair to continue to grow upward through the *hair canal* (that portion of the follicle cavity above the inner root sheath).

There are two distinct layers that are referred to as "cuticle." One is the cuticle layer of the hair and the other is the cuticle layer of the inner root sheath. Both layers are shingle-like, but the shingles or imbrications point up on the hair and point down on the inner root sheath and therefore lock together, holding the hair firmly in place.

OUTER ROOT SHEATH

Surrounding the inner root sheath is the *outer root sheath* which constitutes the follicle wall. The thickness of the outer root sheath is uneven causing the hair to be more or less eccentric in the follicle. The outer sheath does not grow upward with the hair but remains stationary. At the level of the sebaceous gland and above, the cellular structure of the outer sheath cannot be distinguished from that of the surface epidermis, which is why the follicle is referred to as an indentation of the epidermis. The cellular structure of this sheath contains large amounts of water soluble animal starch (glycogen) and appears most spongy in the middle third of the follicle. (The electrologist's currents makes use of the greater moisture present at this level.)

The outer sheath is actually a continuation of the mitotic layer of the epidermis, the stratum malpighii. This outer root sheath is the permanent source of the "hair germ" cells, from which new follicles are constructed when stimulated to action by local enzymes or hormones. This important function will be discussed in greater detail when we take up the dynamics of hair growth.

At the upper part of the follicle where the outer sheath blends with the epidermis there is some mitotic action that causes a keratinized surface layer to be produced. This is sort of a horny build-up that collects around the hair at the follicle opening. Because it is constantly being built up and sloughed off, its presence often causes difficulty to the electrologist. It sometimes blocks the follicle opening so effectively that it makes the insertion of the needle almost impossible.

CONNECTIVE TISSUE SHEATH

Outside of the follicle is the *connective tissue sheath*, which surrounds not only the follicle but the sebaceous glands as well. This papillary tissue serves the same function for the follicle that its counterpart, the papillary layer of the dermis, does for the epidermis; it provides both nerve endings and blood supply. The connective tissue sheath actually represents a continuous extension of the papillary layer of the derma and includes the dermal papilla itself. The dermal papilla, as we have mentioned, is the crucial source of sustenance for the entire follicle structure. To appreciate the manner in which the dermal papilla cells and the hair germ cells interact, we must examine the life cycle of the follicle, in which old hairs are replaced by new ones.

Dynamics Of Hair Growth

We have observed that many hairs begin as lanugo hairs and by glandular stimulation grow deeper, developing a bulb which encases a life-supplying papilla. During this process the hair increases in coarseness, takes on pigmentation and assumes the structure of a terminal hair. This process, however, it is not the ordinary life cycle (shedding cycle) of any single hair. Much lanugo hair remains lanugo hair for the lifetime of the individual. The same is true of most other hairs. Each of these hairs—lanugo, intermediate and terminal—has its own cycle of exchange or shedding, by which new hairs of the same type replace the old.

The lifetime of a terminal hair varies greatly among the various areas of the body and will differ from person to person. Lashes and brows last the shortest, dropping off after a scant four or five months. Scalp hair, on the other hand, averages from two to four years, with some individual cases ranging to seven years. The average growth rate of hair is approximately one half inch per month, but the rate varies according to the type. In man each follicle has its own independent cycle, so man does not undergo periods of shedding as do certain animals. From 25 to 50 scalp hairs are lost each day by shedding.

At a certain time in its cycle, for reasons not too clearly understood, a terminal hair will separate from its papilla and, over a period of days, rise to the middle of the follicle, while retaining its attachment to the follicle wall. In this stage, it is called a *club hair.* After the club hair has risen, that portion of the follicle below the hair apparently shrinks upward, forming an *epithelial sac* beneath the base of the hair. The club hair is capable of obtaining some sustenance from the follicle wall, for it continues to grow from its new situation, deriving its nutrition from the sub-papillary plexus of the skin. Nevertheless the new location is not permanent, and the club hair continues to rise until it has reached a point just beneath the opening of the duct of the sebaceous gland. Here it can no longer be nourished by the vascular supply, and it eventually becomes disengaged from the follicle wall entirely. The loosened hair then either falls out or is brushed away.

There is general agreement that the lower half of the follicle, including the outer sheath, comes and goes with the cycle, whereas the upper half remains stable. When a hair has been shed the follicle has degenerated to half its normal length. Within a period of from 60 to 150 days a new follicle will be constructed and the cycle will have begun all over.

Stages Of Development

Histologists divide the growth cycle into three stages called *anagen*, *catagen* and *telogen*. Anagen is a period of active growth, beginning at the moment the inactive follicle "comes to life," and descends to the papilla. This stage ends when the dermal papilla ceases to nourish the hair, at which time the hair comes loose from the papilla. During *catagen* the lower half of the follicle degenerates and the cells undergo a "retrograde morphogenic transformation," which is a complete reversal of the growth process. *Telogen* is a period of rest following catagen, at which time all that remains below the upper half of the follicle is a collection of "hair germ" cells from the outer root sheath and the

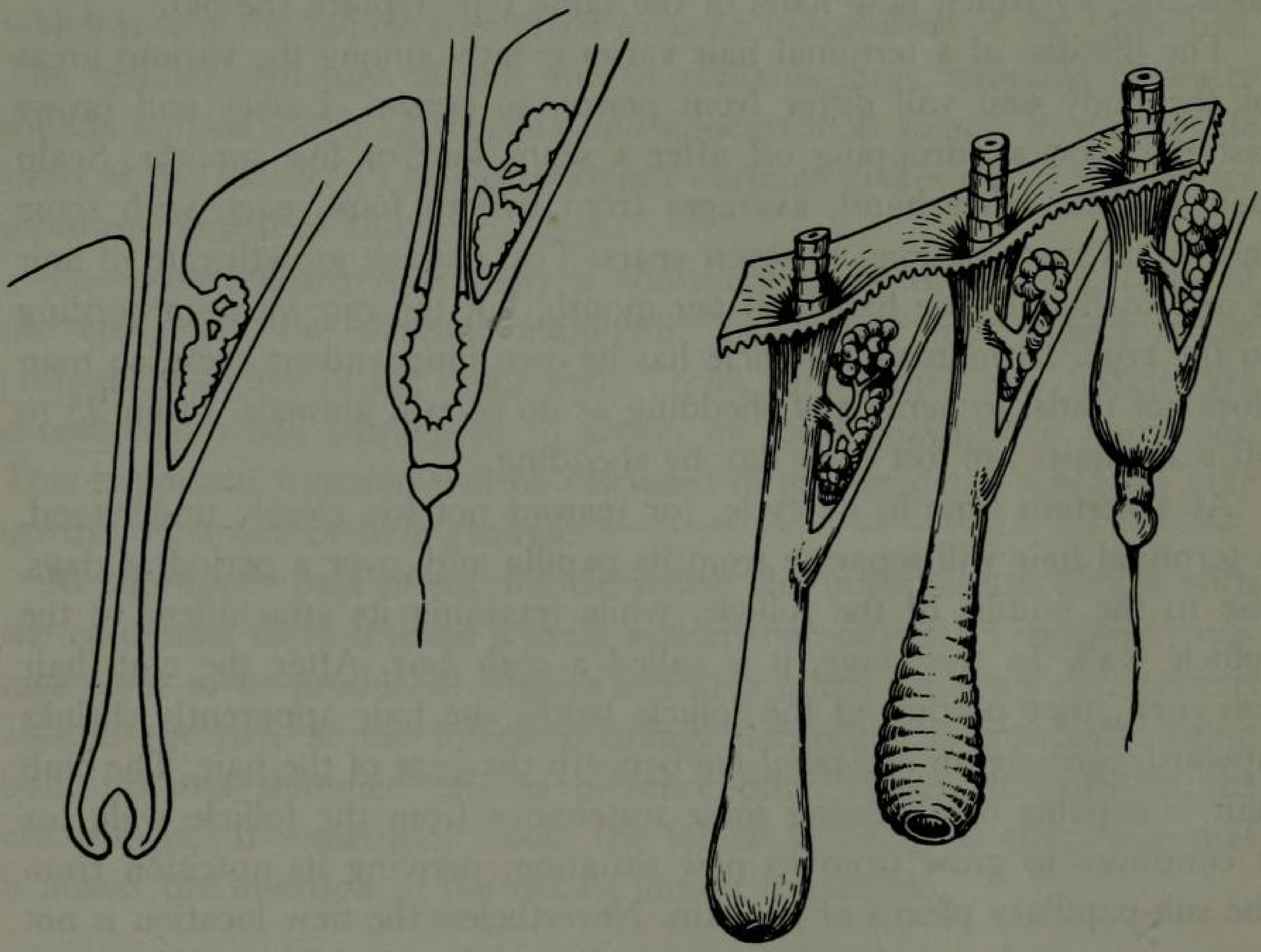

FIGURE 10. *Stages of follicle development. The diagram on the upper left shows a growing follicle (anagen), the one on the upper right a quiescent one (telogen). The lower diagram shows a follicle in anagen on the left, one in catagen in the middle and one in telogen on the right. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

dormant dermal papilla cells. These cells are the basic units from which all later follicles will grow and to which each will ultimately return.

ANAGEN

The first phase of each cycle involves a complete rebuilding of the lower half of the follicle. At the beginning of anagen the hair germ cells, which extend downward from the base of the remaining follicle structure in a solid column called the *dermal cord*, proceed to multiply by mitosis and grow in width and depth into the subjacent dermis. Meanwhile at the tip of the cord a rounded depression is formed, into which have gathered the basic dermal papilla cells. This structure continues in its downward direction, the cord giving rise to the growth of the entire follicle, while the papilla cells blossom into the life-giving papilla. The lower part of the cord develops into a bulb which encases the papilla.

At a point before the follicle has reached its ultimate depth, the mitotic cells in the lower part of the bulb, called the *matrix*, begin their activity. See Figure 11. Out of the matrix spring all of the growing elements of the hair. These cells move upward from the matrix differentiating into hair and inner sheath. Keratinization occurs in the upper part of the bulb, producing a keratinized cone which spearheads its way through the solid cord, forming the inner sheath. Another keratinized structure, the hair itself, follows the tip of the advancing sheath, and breaks through the apex of the sheath about two thirds of the way up the follicle, entering the permanent upper follicle and proceeding out through the pore as a visible shaft of hair. Throughout this time the follicle has continued to grow downward into the dermis. Not until the hair has grown approximately half an inch beyond the surface does the follicle cease to expand downward.*

Figure 11 illustrates the four basic regions of specialized activity in the growth of hair. Below the critical level is the *matrix*, all the cells of which are mitotically active. The new cells pass upward to the *upper bulb*, where they first increase in size and then become elongated. While the cells are in the upper bulb and for some short distance beyond, in the region of *cell growth* and *differentiation*, the cells proceed to differentiate into those elements which comprise the three-layer structure of mature hair. However, up to and through this region, the on-rushing structures are still "soft." The *keratogenous zone* applies the final touch to nature's product, solidifying the structure with keratin. The com-

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*This is an important point to bear in mind when giving treatments. The shallower the hair the easier it is to treat effectively. Therefore, a hair in early anagen is the most desirable to treat.

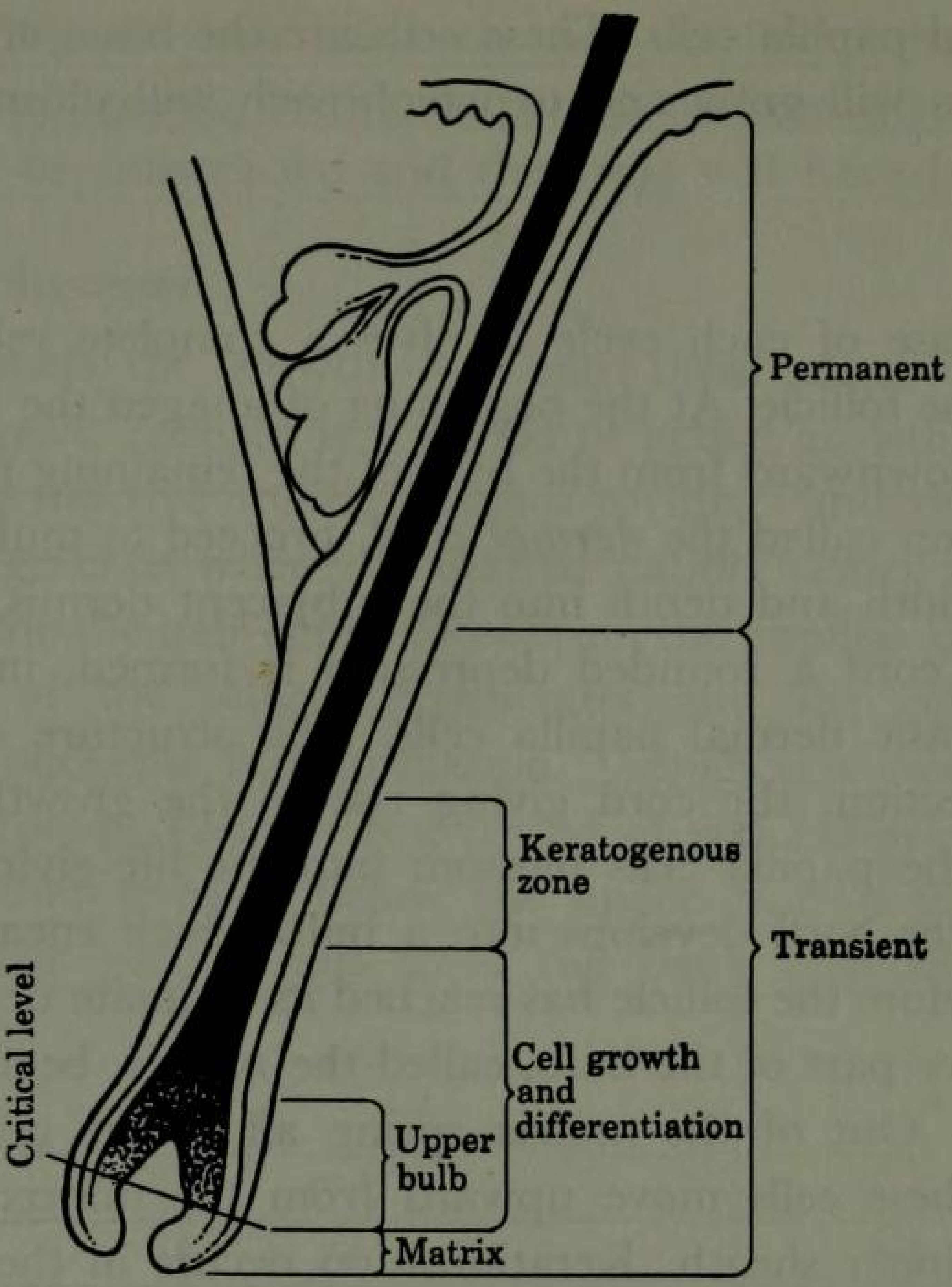

FIGURE 11. *The regions of an active follicle in anagen. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

pleted hair structure emerges from this zone approximately one third of the distance from the bottom of the follicle as a solid, durable shaft.

CATAGEN

After a certain period of constant growth, the catagen stage begins. Apparently the papilla suddenly separates and withdraws from the matrix. As it rises, the hair is still rooted somewhat in the follicle walls, and continues to be sustained in its growth by whatever nourishment is available from this secondary source. However, the collapse of the papilla initiates a degeneration of the follicle structure, causing undifferentiated cells to move inward into the area of the lower follicle. These cells form the dermal cord. Meanwhile, as we have mentioned, the hair becomes detached and is either shed or remains dormant, its club root lodged in the upper half of the follicle.

The period of time in which a follicle is in catagen is extremely short. A very small percentage of the hairs on any given area are in the catagen stage. Frequently, a follicle goes through this stage so rapidly that the follicle has no time to collapse. In such cases a new hair begins to emerge from the base of the follicle before the club hair has been shed, with the result that two hairs are found emerging in tandem from the same follicle, one firmly anchored to the base of the follicle, the other lodged in the upper portion of the follicle. See Fig. 12, 13.

TELOGEN

Upon completion of the catagen stage, the upper portion of the follicle usually rests until stimulated to begin a new cycle. This period of rest

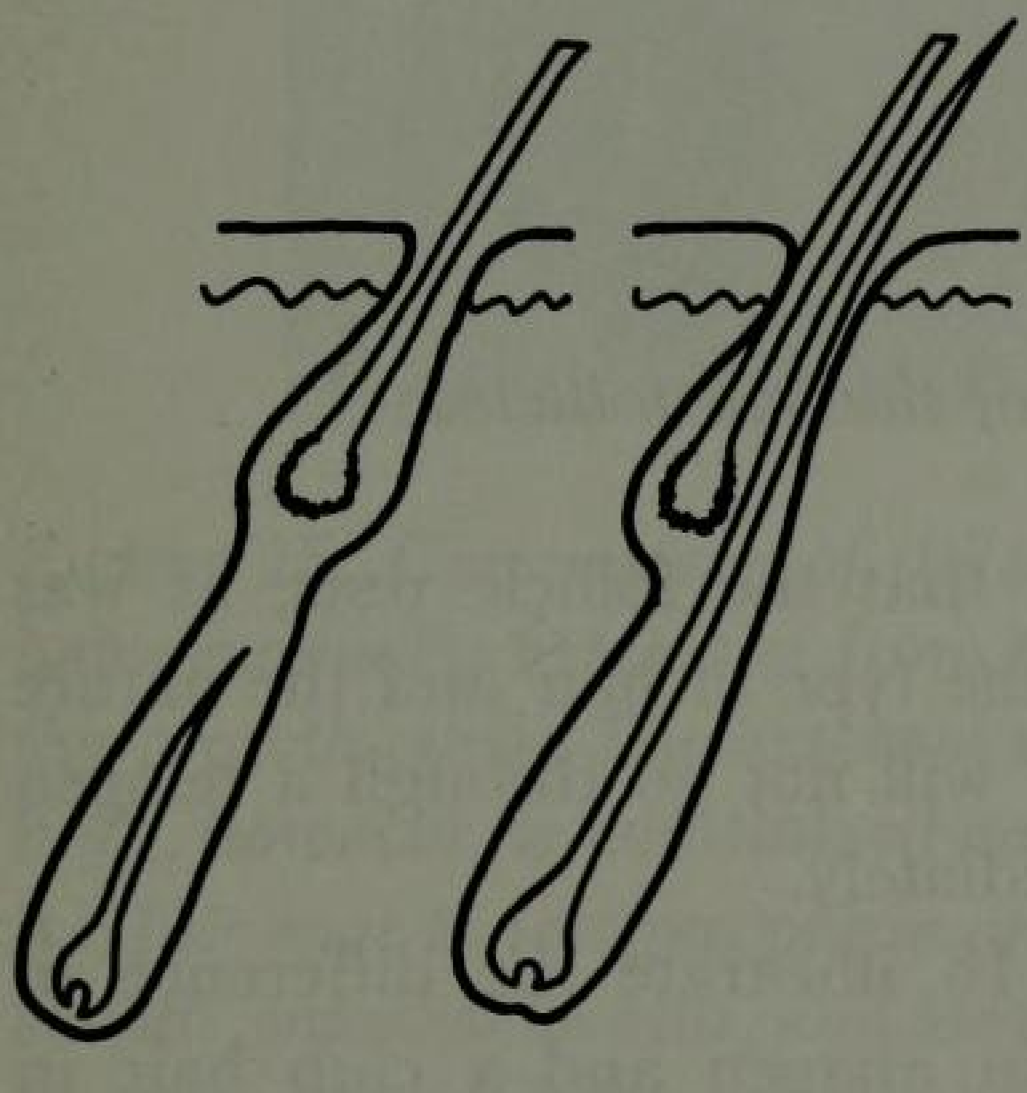

FIGURE 12. *New hair emerging before club hair has shed.*

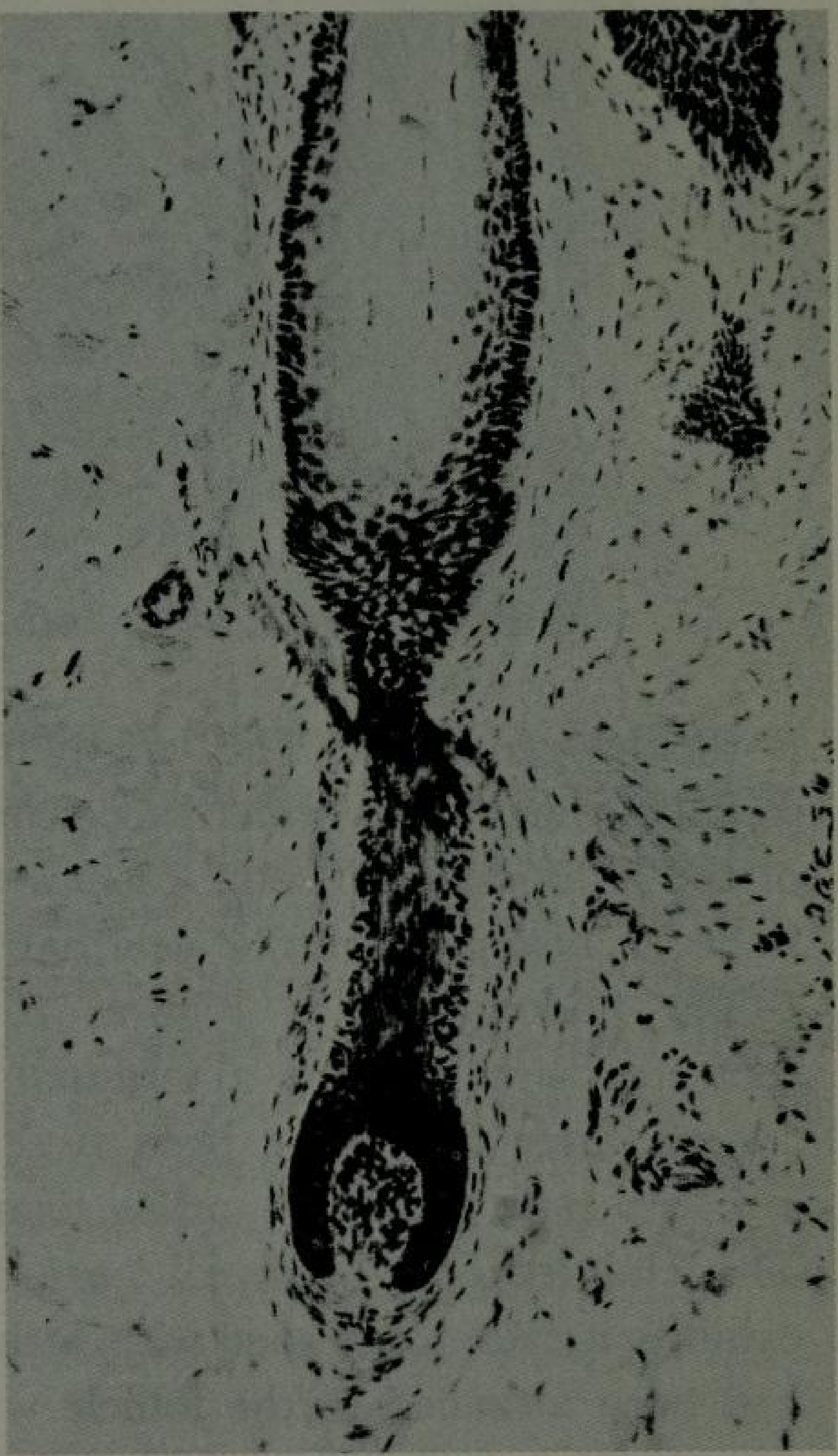

FIGURE 13. *Regeneration of new hair. Papilla surrounded by incompletely differentiated hair bulb. Beginning development of keratogenous zone in new hair. (Reprinted from Physiology and Biochemistry of the skin by Stephen Rothman, M.D., by permission of the University of Chicago Press.)*

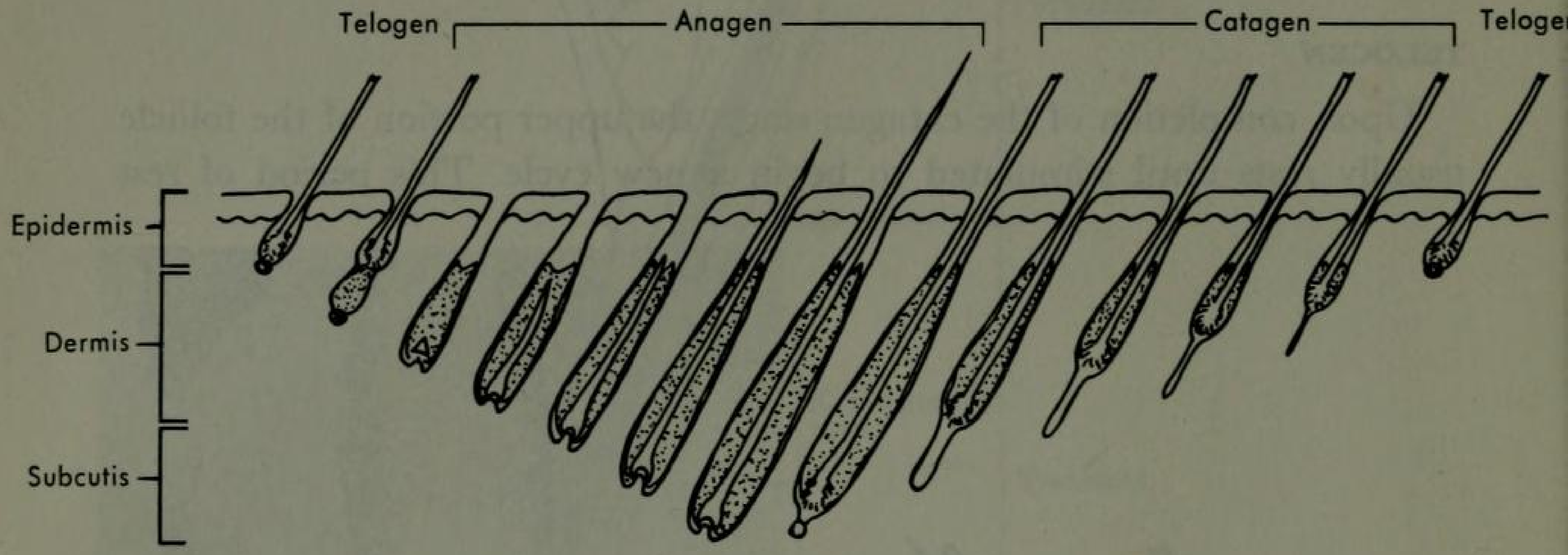

Figure 14. *The growth cycle of the hair follicles.*

is the telogen stage. The length of time that the follicle rests, as was stated earlier, varies widely according to the type of hair and the nature of the individual. In some cases a follicle will not go through a telogen stage: it begins to form a new hair immediately.

The photographs in Figures 15 and 16 illustrate the difference in root structure between a terminal hair in anagen and a club hair in telogen after they have been tweezed. The normal terminal hair slips out with bulb and surrounding tissue intact; it has a shiny look about it. The club hair has lost all contact with the surrounding tissue, and exhibits a clean, dry root with little straggly anchors by which the hair had been attached to the follicle wall.

Growth Potential In The Pilosebaceous Unit

To the electrologist, the most significant phase of hair growth is the process by which the pilosebaceous unit is able to replace a degenerated lower follicle. Practicing electrologists are well aware of the weed-like obstinacy of this hair germinating process; regrowth from insufficiently-treated follicles is a major occupational problem. It follows that no electrologist is equipped to eliminate hair permanently until she appreciates the degree of cellular destruction she must induce to remove all sources of potential regrowth.

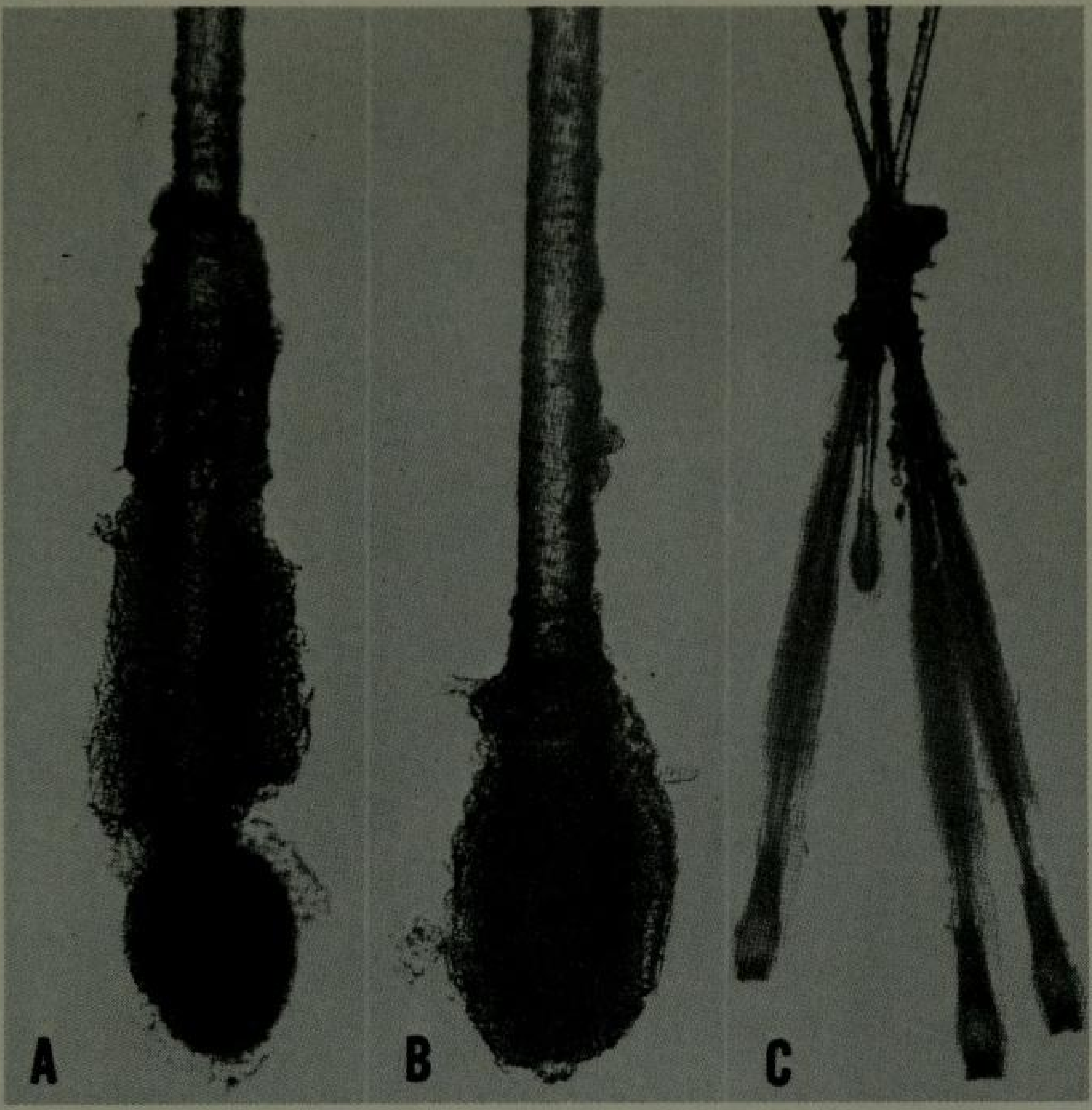

Figure 15. *Comparison of different stages of the growth cycle in roots of hairs manually extracted from the scalp. A. Hair root in catagen phase of the growth cycle. The external sheath and internal sheath are present. The bulb, however, is keratinized and a keratogenous zone cannot be detected. B. Hair root in telogen phase of the growth cycle (club hair). The external sheath, internal sheath, and keratogenous zone are absent. The keratinized bulb is surrounded by the epithelial sac. C. A group of four hairs that had emerged from the skin through a common follicular pore. The three lower hair roots are anagen in type; the upper one is telogen in type. (Reprinted from the Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

Unhappily for the electrologist, there has never been a thorough laboratory investigation of the effect of electrical action on the growth cycle of the follicle. Electrologists have traditionally relied on the theory that destruction of the (dermal) papilla is sufficient to eliminate future growth, but they have never been able to point to specific research on the subject. Moreover, a high regrowth rate from certain electrical technics (principally flash thermolysis), offers persuasive evidence that exclusive destruction of the papilla is insufficient for eliminating the follicle permanently. Factors other than the existing papilla appear to be involved. Because of the lack of direct research on the subject, only

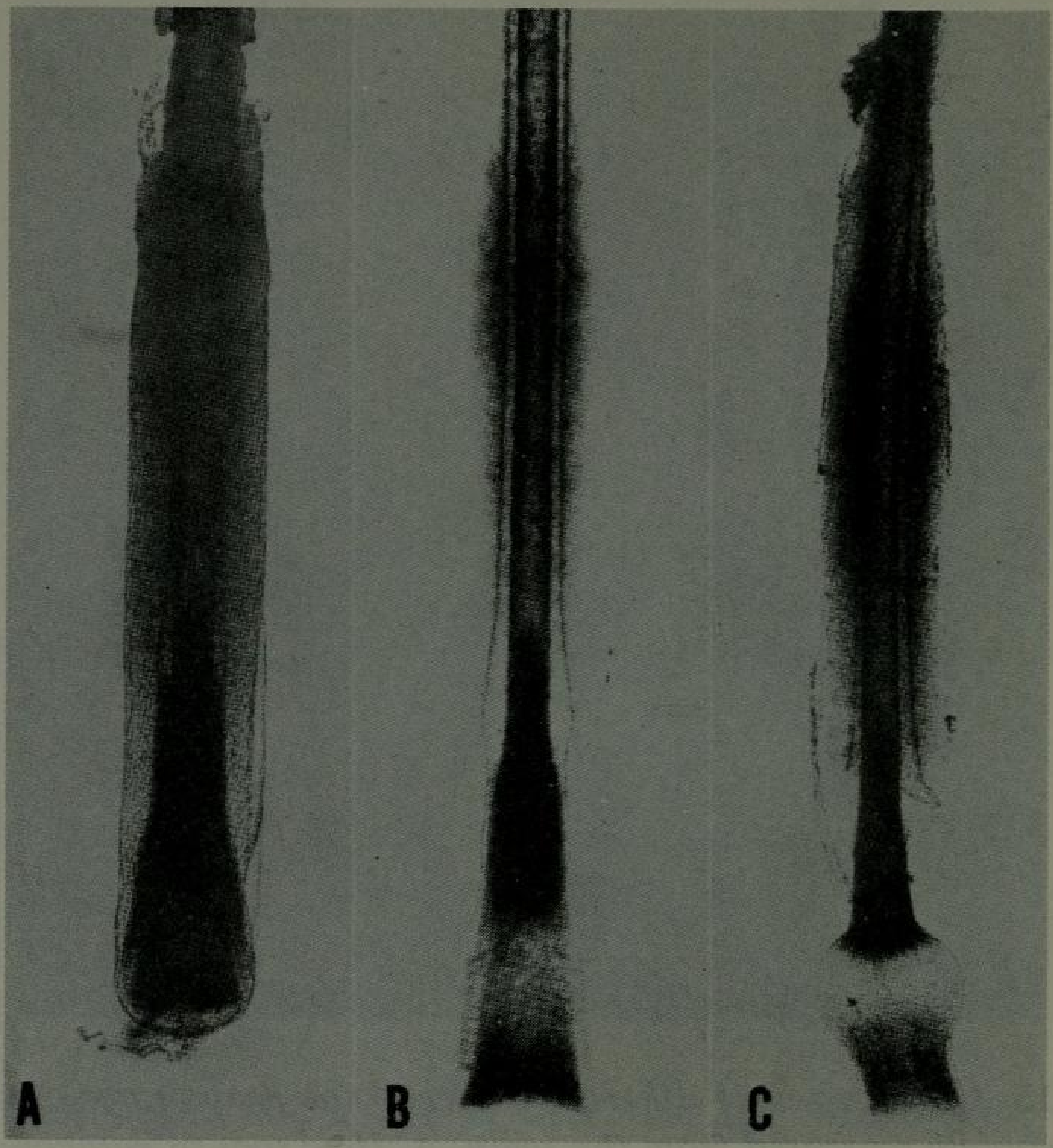

Figure 16. *Roots of manually extracted anagen hairs of the scalp, viewed microscopically by transmitted light. A. Root with sheaths intact. A portion of the connective tissue hair papilla remains attached to the matrix portion of the bulb, a circumstance only infrequently found in plucked hairs. B. Root of a hair with only its internal sheath intact at the bulb. C. Root of hair with its internal and external sheaths torn at the level of the keratogenous zone. (Reprinted from the Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

a careful analysis of follicle histology can help us to discover the factors which cause regrowth from insufficiently treated follicles.

Authorities are in general agreement that two distinct structures are necessary to support the growth of hair, the follicle and the papilla. During anagen, the papilla is identifiable as the connective tissue element enclosed by the mitotically active hair bulb; the papilla provides the nutriments for growth, while the follicle uses these nutriments to generate the hair. Obviously, if the papilla is damaged or destroyed during this phase of growth, the cycle will be interrupted, the hair will loosen from the follicle bottom, and the existing follicle itself, now lacking its source of sustenance, will wither away as it does in the catagen stage. Whether or not a new follicle will eventually develop is the object of our inquiry.

Let us examine the mechanics of the growth process more closely. In the normal stage of telogen, the papilla persists as a compact ball of inactive dermal cells which have risen during catagen to a position which will vary in distance from the upper follicle according to local conditions. The shrunken lower follicle, called at this stage the epithelial sac, maintains contact with the dermal papilla by means of the dermal cord. This slender strand of hair germ cells, the cord, acts in intimate partnership with the inert dermal papilla. So long as the dermal cord completely bridges the gap between the upper outer follicle sheath and the papilla, the hair germ cells and the papilla cells will "team up" to build a new follicle structure when stimulated by local biochemical processes.

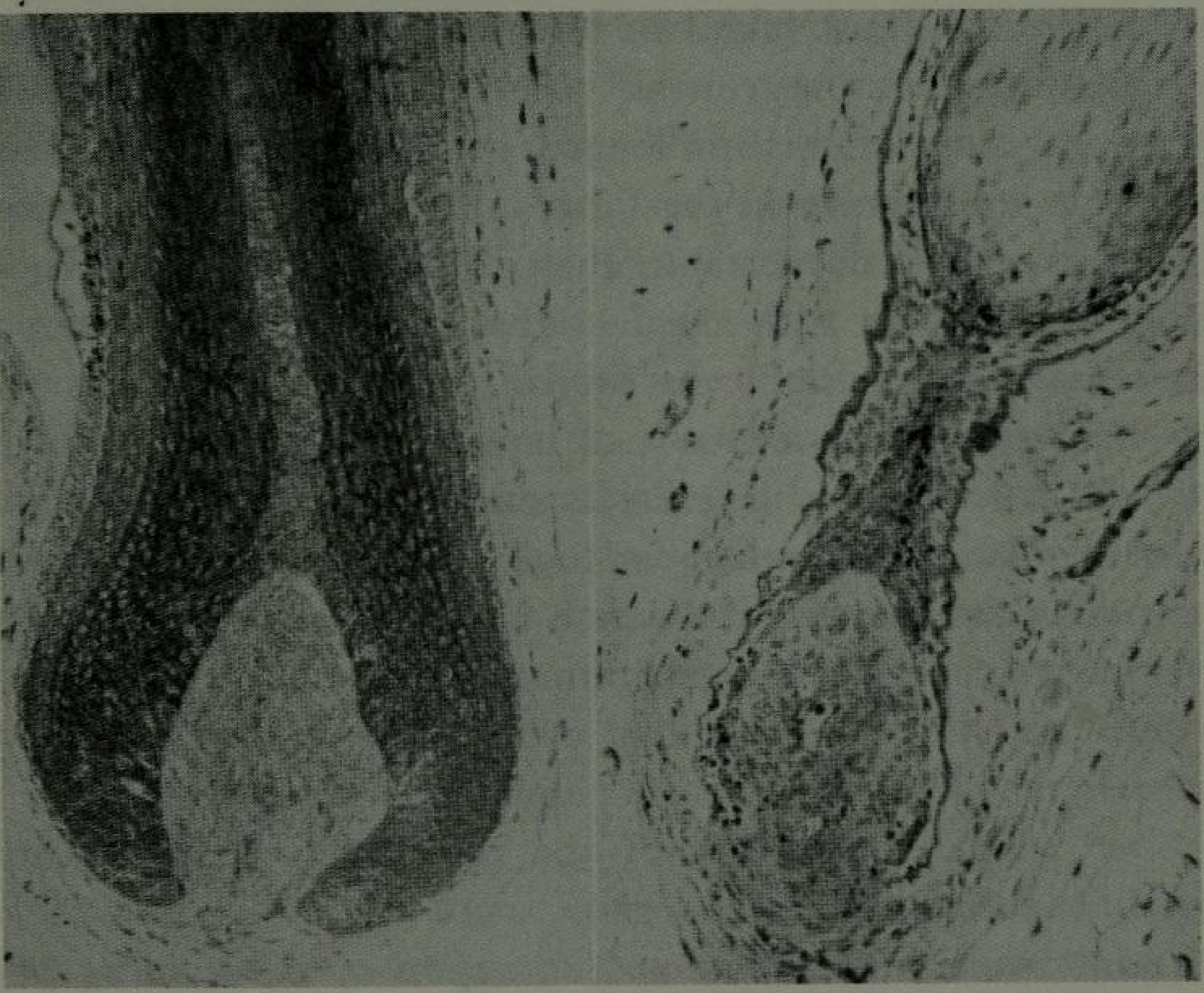

FIGURE 17. *Locations of papilla in anagen and catagen. Hair follicles from the scalp. On the right is the bulb of an active follicle; on the left is the lower part of a follicle during catagen. In the upper right hand corner of this figure, a club hair is being formed; the matrix is completely degenerated, and the dermal papilla is being released. The vitreous membrane around the degenerating bulb is very thick. (Reprinted from The Structure and Function of Skin by William Montagna, by permission of the Academic Press Inc., New York, New York.)*

It has been discovered through research (Montagna) that if the contact between the dermal papilla and the hair germ cells has been lost, the "partnership" is dissolved and no new hair can be formed from the *existing* structures. It follows that if the electrologist were to destroy the papilla at this stage, the existing team of cells will have been broken up for good. This fact seems to substantiate the electrologist's traditional claim that elimination of the papilla at any stage in the growth cycle—anagen, catagen or telogen—is sufficient to prevent a pilosebaceous unit from producing new hairs. Yet, there is the question of high regrowth to be considered. The only interpretation which electrologists have been able to offer is that regrowth is a sign of failure to destroy the existing papilla, either because of insufficient current or failure to insert accurately. Some electrologists even go so far as to blame the problem on "distorted" follicles or multiple papillas (pili-multigemini), phenomena which are relatively rare.

To come to a realistic interpretation of regrowth from improperly treated follicles, we must take two important factors into consideration. One is the fact that "regrowths" from insufficiently treated follicles usually appear only after a prolonged period of quiescense. The other is that they usually return in the form of fine hairs which require many weeks to darken and deepen into the original type of hair. These considerations do not jibe with the fact that, normally, replacement hairs are immediately recognizable as similar to their predecessors. Instead, the new hair gives every evidence of having emanated from an *entirely new follicle structure and papilla*, beginning as if from a lobe of the sebaceous gland and deepening eventually into a mature structure. Thus, there appear to be two ways in which new follicles can be formed after a faulty treatment: (1) by regeneration of the undisturbed dermal cord and papilla (in a normal shedding cycle), and (2) by construction of a completely new lower follicle and papilla from those cells which remain intact after partial destruction of the cell structure. The latter is of great significance to the electrologist.

If our interpretation is correct, *destruction of the existing papilla is not sufficient* to frustrate the growth of new hairs from any given pilosebaceous unit. The hair germ cells themselves must also be eliminated. As research has revealed, the cells of the outer sheath in the upper part of the follicle comprise the permanent portion of the hair germ. These cells are known to possess a variety of potentialities. When sebaceous glands are destroyed, for instance, the cells readily produce new gland structures to replace those which were lost. There is no reason why these cells could not replace a lost follicle structure as well, after its papilla cells had been destroyed.

The crucial fact to be considered here is that most hairs treated by the electrologist are growing in follicles which originated through the catalytic action of androgenic hormones (cf. Chapter I). Prior to the very first stirrings of hormone stimulation there were no existing papillas or dermal cords at the sites of these hairs—just hair germ cells in the area of the sebaceous glands and certain versatile cells capable of forming a papilla in the adjacent connective tissue sheath surrounding these glands. These were the potentials of the "team" of hair germ and papilla cells required to build a follicle, complete with papilla; it took only androgenic action to initiate their development.

The same conditions which originally brought about the hair that a patron wants removed are usually still present at the time of treatment. The average patron possesses a high amount of androgenic hormones, and all of the team-building tissue. Therefore, if the electrologist destroys only the existing papilla, the ever-present hormones could easily stimulate a brand new team of cells into action, especially since injury to the area will have increased the local supply of life-giving blood. To produce a new follicle-building team the only parts of the follicle which need to survive are the upper outer root sheath and remnants of the connective tissue sheath which have remained intact. The resulting new hair would be exactly like the "regrowth" we have been discussing; it would take a long time to appear and it would begin as a finer hair than the one it replaces, eventually accelerating to the depth of the former follicle.

The evidence seems to point to the conclusion that any pilosebaceous unit which still possesses hair germ cells and dermal cells has the potentials for renewing its function to produce hairs when stimulated by androgenic action. We therefore have good reason to believe that hair germ cells and dermal cells are just as vital a target for the electrologist as the existing dermal papilla.

Summary

The foregoing interpretations concerning the growth of hair were developed from recent writings on the *normal* growth of human hair. (See the bibliography at the back of this book.) To date there has been little research on the artificial interruption of the shedding cycle. We do not know, for example, exactly what happens when the electrologist's needle introduces destructive currents into the follicle. The answer to this question is still a matter of theory—theory of little interest to anyone but the electrologist and for that reason largely unexplored.

In the absence of relevant research, the electrologist is best off adopting the most conservative theory—that is, the theory which holds that only the most thorough destruction can permanently eliminate regrowth.

The old-fashioned notion that only the papilla needs to be destroyed has been shown to be a gross oversimplication. It is known that a follicle is capable of more than one papilla. Even if the lower half of the follicle and the papilla are completely destroyed, the evidence indicates that an entirely new follicle can be constructed in its place.

It is evident that the electrologist must attempt to destroy the *lower two-thirds of the follicle* and a good portion of the connective tissue sheath to do an effective job. Only in this way can she be assured that she has eliminated all potentials for regrowth among existing hair germ and papillary cells. This fact will be of vital importance in our discussions of professional technics, to be taken up in the chapters on electrolysis, thermolysis and the blend.

APPENDIX: VARIATIONS IN FOLLICLE STRUCTURE

It is extremely difficult to envision the actual structure of pilosebaceous units simply from slides or drawings of them. However, Eugene J. Van Scott has developed an ingenious method for achieving an accurate "picture" of follicle structures with a set of three-dimensional balsa wood models.* In order to insure that the follicle models were perfectly proportioned, Scott used actual plugs of skin containing follicle clusters. These he sliced into microscopically thin layers, which were then placed on slides, stained and photographed in order to obtain the organ's measurements. Slices of balsa wood were then cut to match the follicle's dimensions on a larger scale, so that when the slices were glued together, a magnified reproduction of the original pilosebaceous unit was formed. (You can see individual layers of wood if you inspect the photographs of the models carefully.) Arrows pointing from certain layers of the model to photomicrographs to the right of each illustration designate the actual section of tissue from which the balsa wood layer was shaped.

By examining and comparing the six pilosebaceous models presented below, the student can appreciate the variety of sizes, shapes and combinations in which these organs grow. All models were constructed with identical magnification so that the photographs which follow show the actual differences in their size. Sebaceous glands have been painted white to aid identification. Unfortunately, no dermal cords could be shown. The student must keep in mind that the true angle of the epidermis in relation to the surface of the epidermis has been ignored for ease of illustration. The follicle is actually very seldom perpendicular with the skin surface. In most instances it will be at an angle half-way between horizontal and vertical (45°).

*"The Anatomy of the Hair Follicle," *The Biology of Hair Growth*, eds. William Montagna and Richard A. Ellis (New York, 1958), pp. 41–45.

Figure 18 is a cluster of three pilosebaceous units from the scalp of an adult man. The deep follicle is active and growing and therefore is in anagen. The short follicle to the left is in telogen. It contains a club hair which is indicated by the letter "C" on the tissue section pointed to by the arrow. The middle unit of this cluster contains no hair but for some reason is now merely a duct for the sebaceous gland.

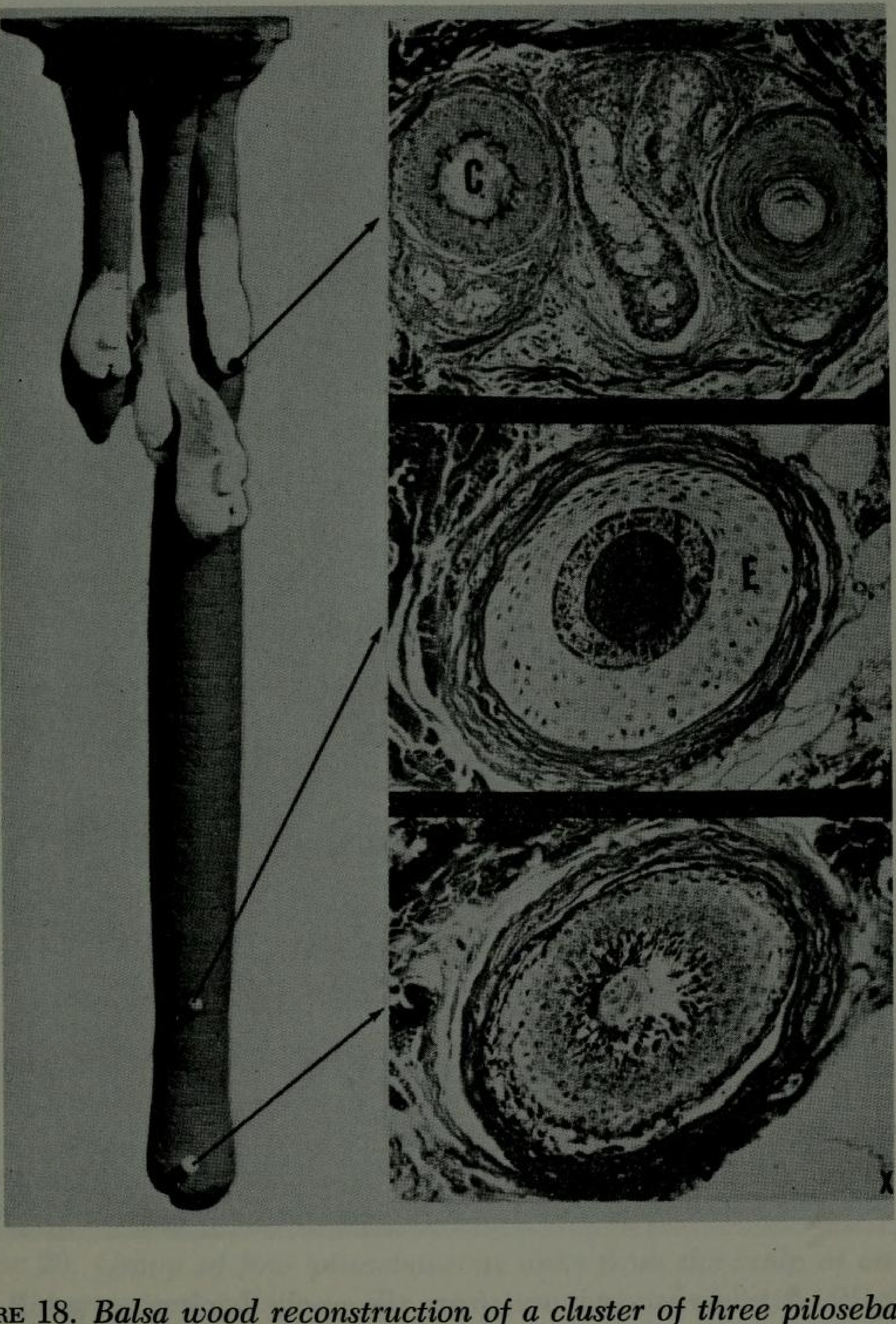

FIGURE 18. *Balsa wood reconstruction of a cluster of three pilosebaceous units from the scalp of an adult man. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

This situation could result from the destruction of the lower half of the follicle by electrology. All three of these units share a common opening at the surface.

Figure 19 shows two hairs sharing the same hair canal, one growing (anagen) and one resting (telogen). Since both hairs reach the surface through a common opening there will be times when two hairs appear together in the opening. In a case such as this, an electrologist might mistakenly insert a needle into one follicle when the hair she wants to epilate is growing from the other follicle.

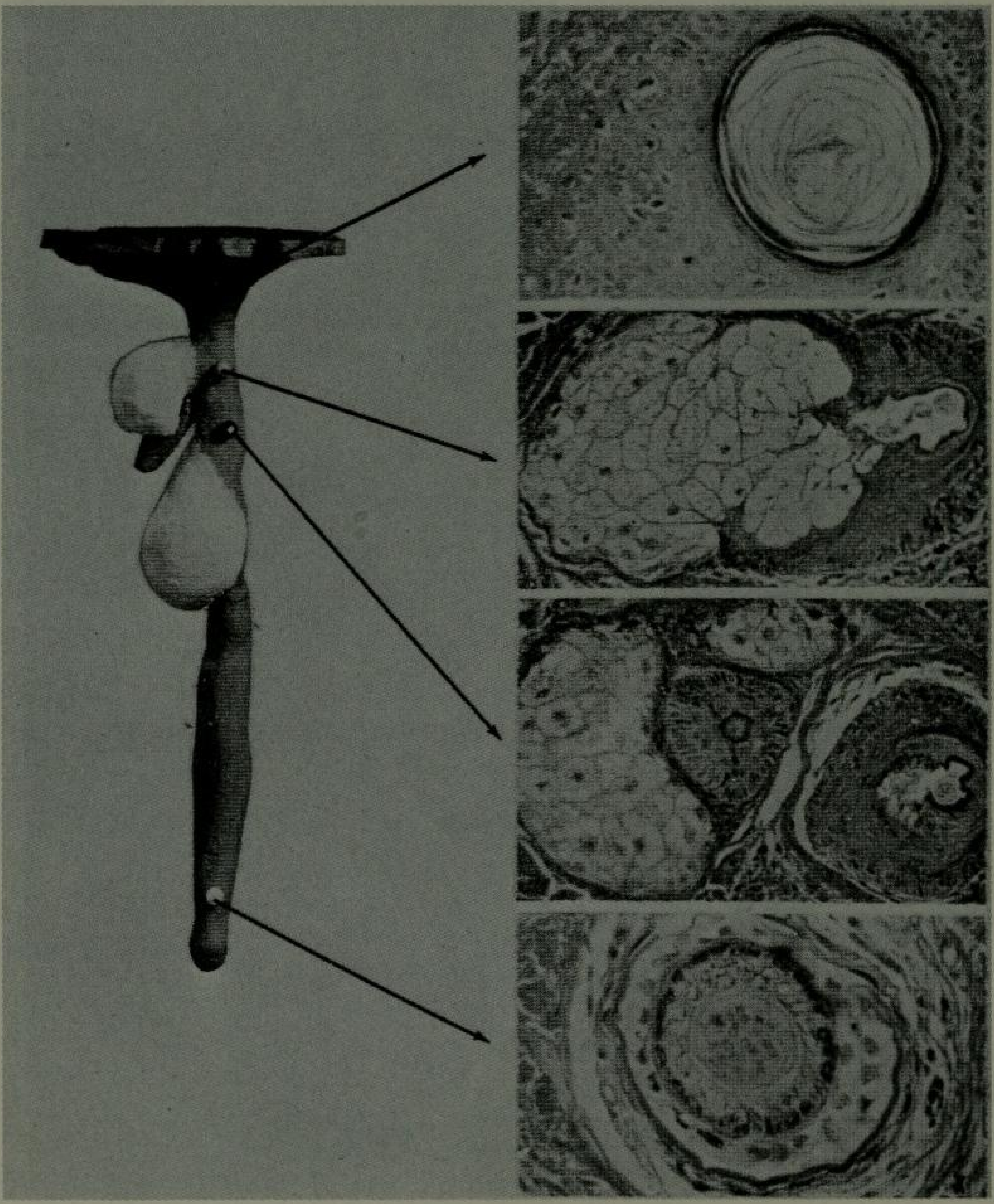

FIGURE 19. *A pilosebaceous unit from the upper back of an adult man. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

Figure 20 is a group of four follicles reaching the surface through one hair canal or opening. Three follicles are actively growing (anagen) while the one at the left rear, partially obscured from view, is resting (telogen). The follicle to the right has no sebaceous gland, but this is not uncommon.

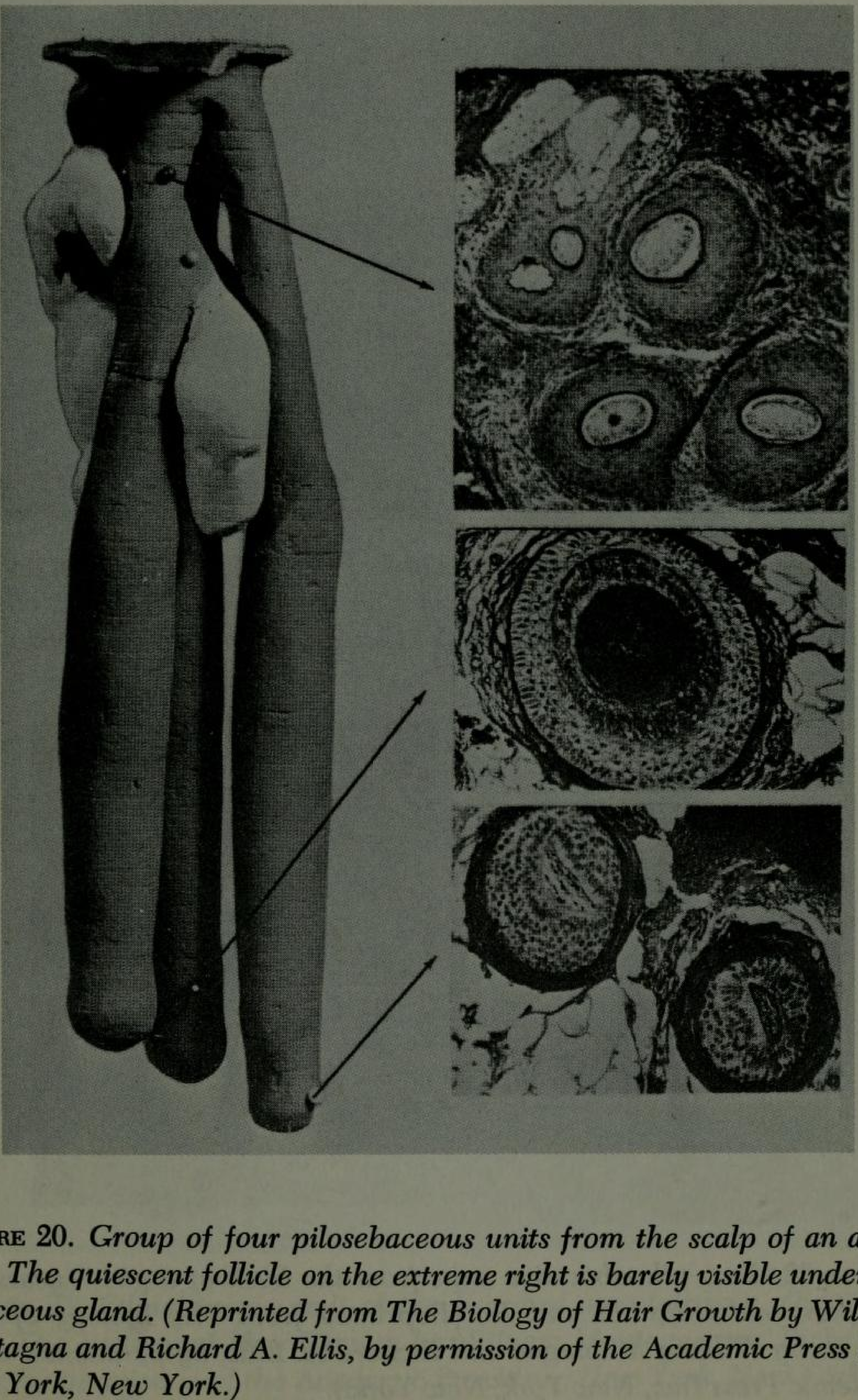

FIGURE 20. *Group of four pilosebaceous units from the scalp of an adult man. The quiescent follicle on the extreme right is barely visible under the sebaceous gland. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

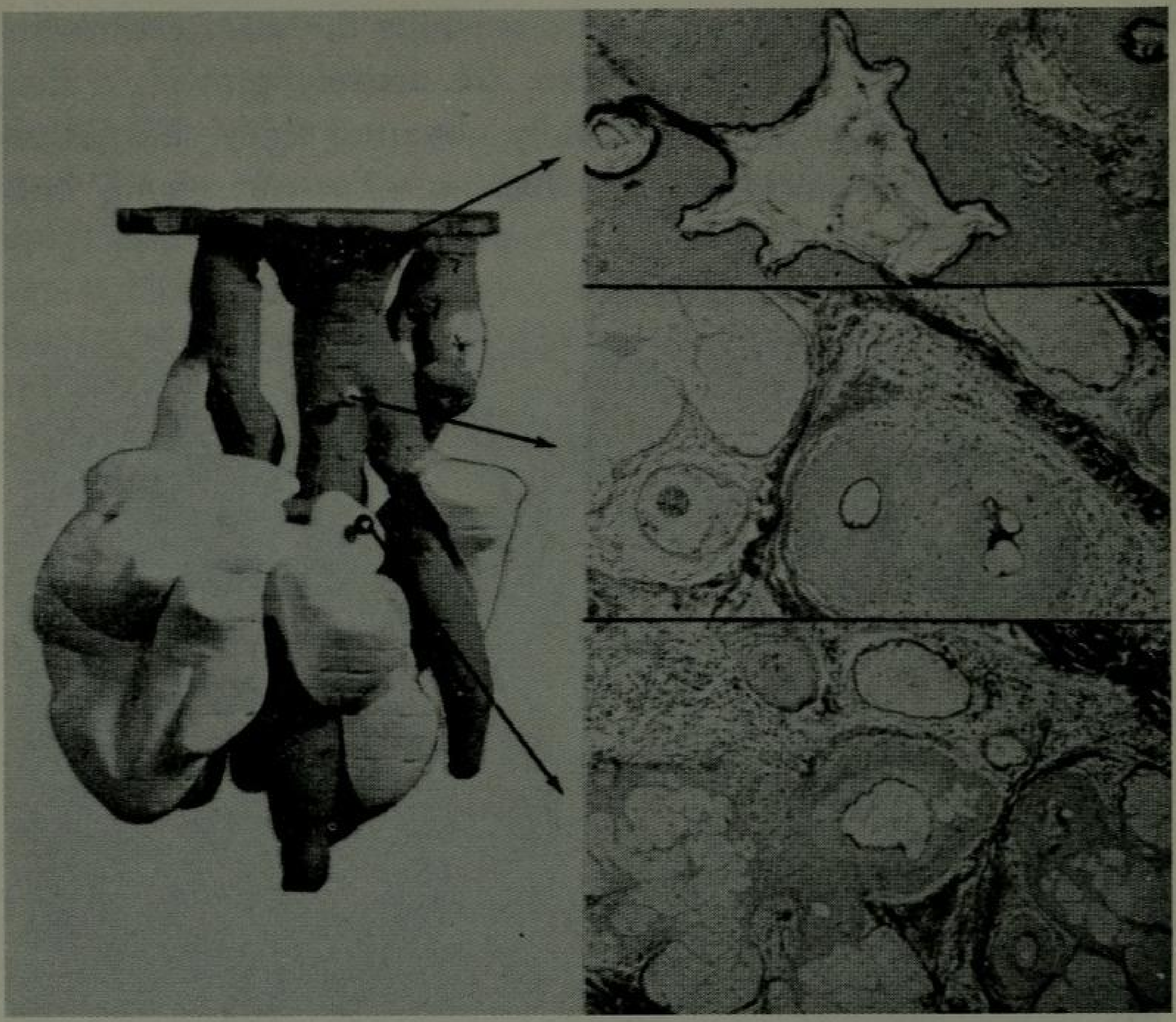

FIGURE 21. *Cluster of pilosebaceous units from the upper back of an adult man. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

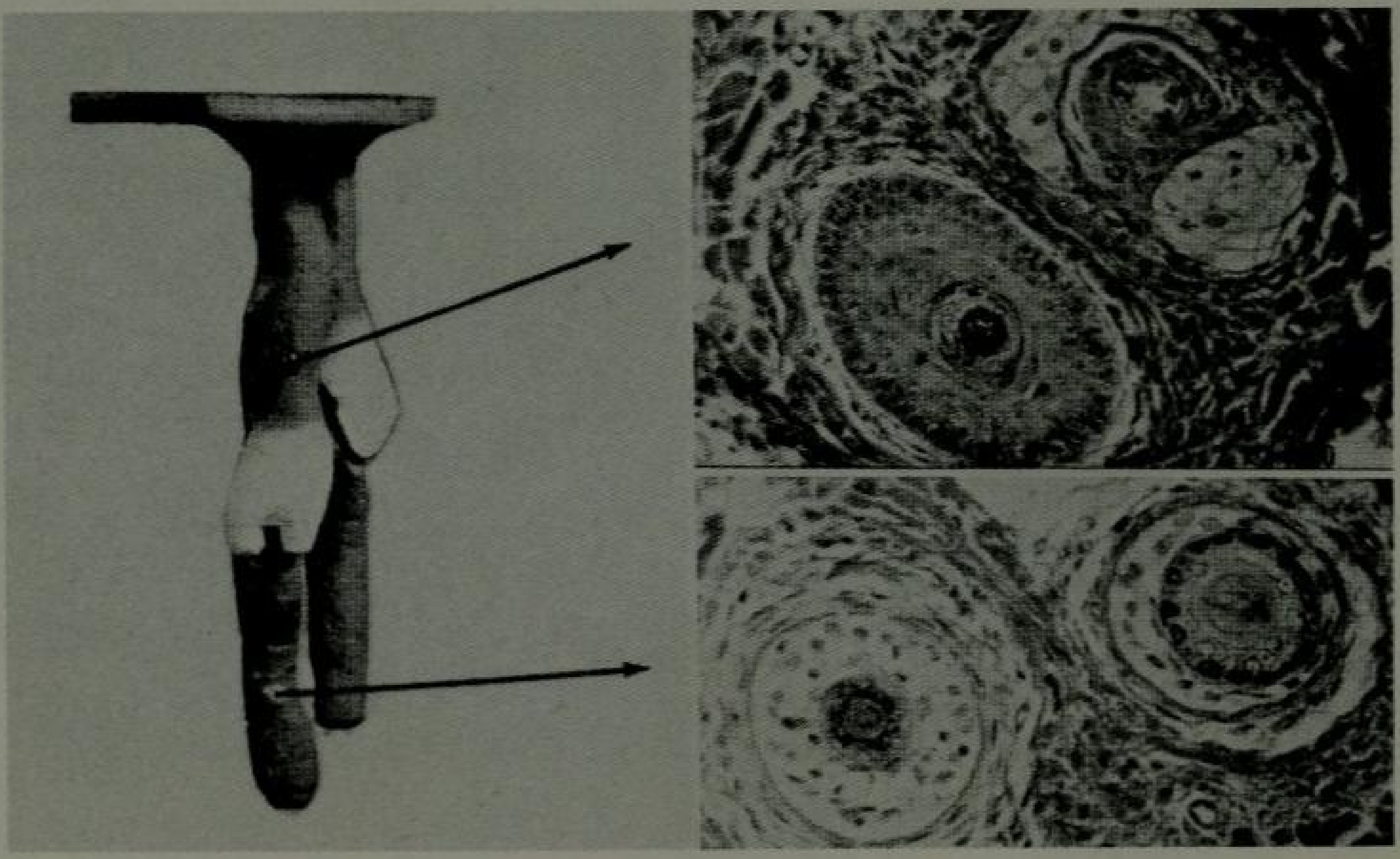

FIGURE 22. *Two pilosebaceous units from the back of a girl 7 years old. Compare with Figs. 18 and 19. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

Figure 21 shows two telogen hairs sharing one hair canal and surface opening. On either side of the resting terminal hair follicles are some lanugo hair growing from their respective sebaceous gland openings.

Figure 22 shows two active follicles from a 7 year old girl's back. Since these *reproductions are all to scale* you can see the shallowness of these follicles in comparison with the depth of the others shown.

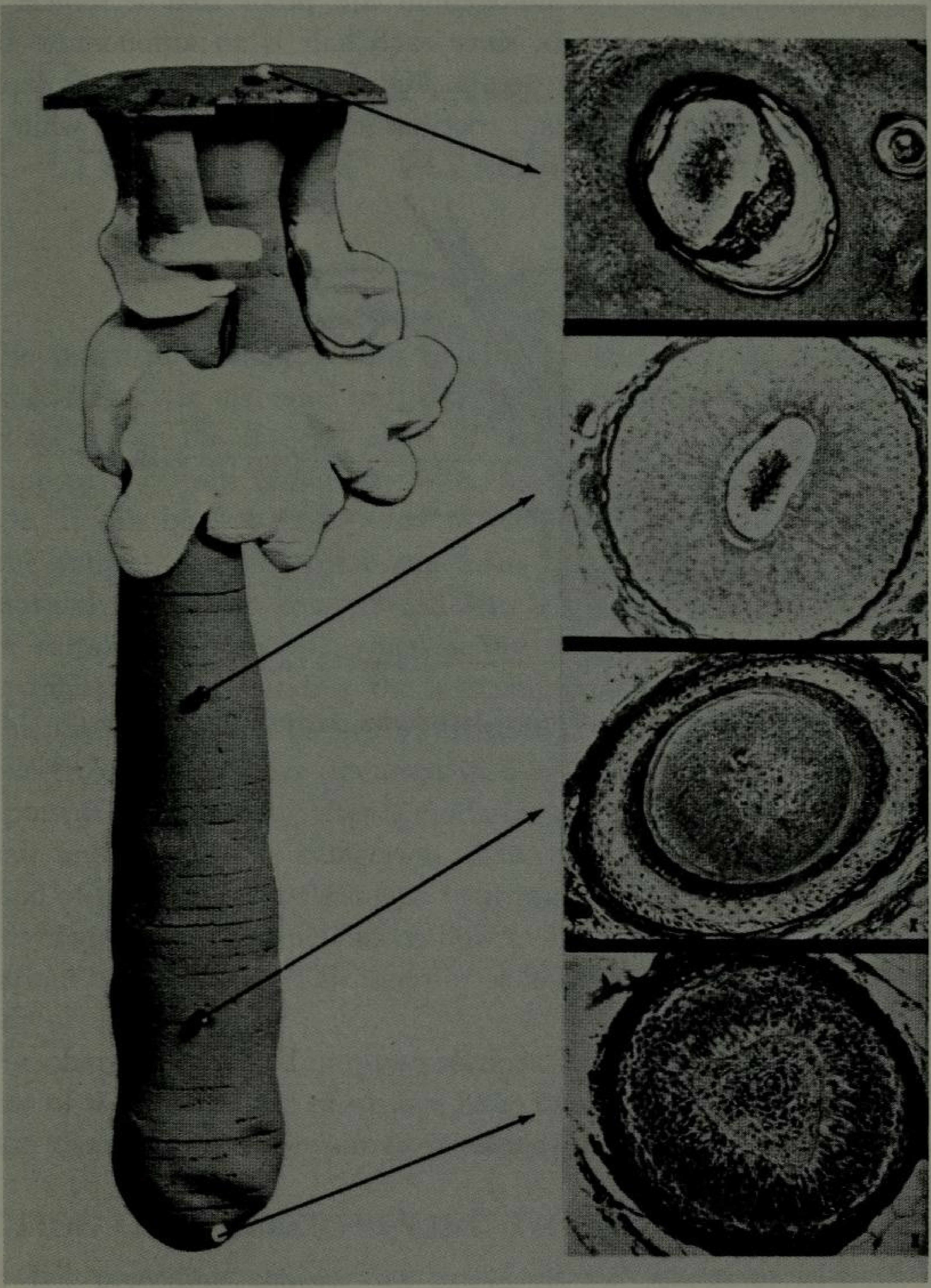

FIGURE 23. *Pilosebaceous unit of the beard of an adult man. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

Figure 23 is the follicle of a beard hair of an adult male. Compare the width of the lower portion of this follicle with the follicle from a man's back shown in Figure 19.

Although no balsa wood model has shown it, another hair structure should be considered in this appendix. On occasion one will find two active hairs emerging from the very same follicle. This phenomenon is called pili-multigemini. Pili-multigemini are proof that a follicle can possess more than one papilla, since each hair is an autonomous unit, with its own bulb and root structure. Figure 24 shows how two papillas share the same follicle. Each hair root has its own inner sheath while one outer sheath surrounds them both.

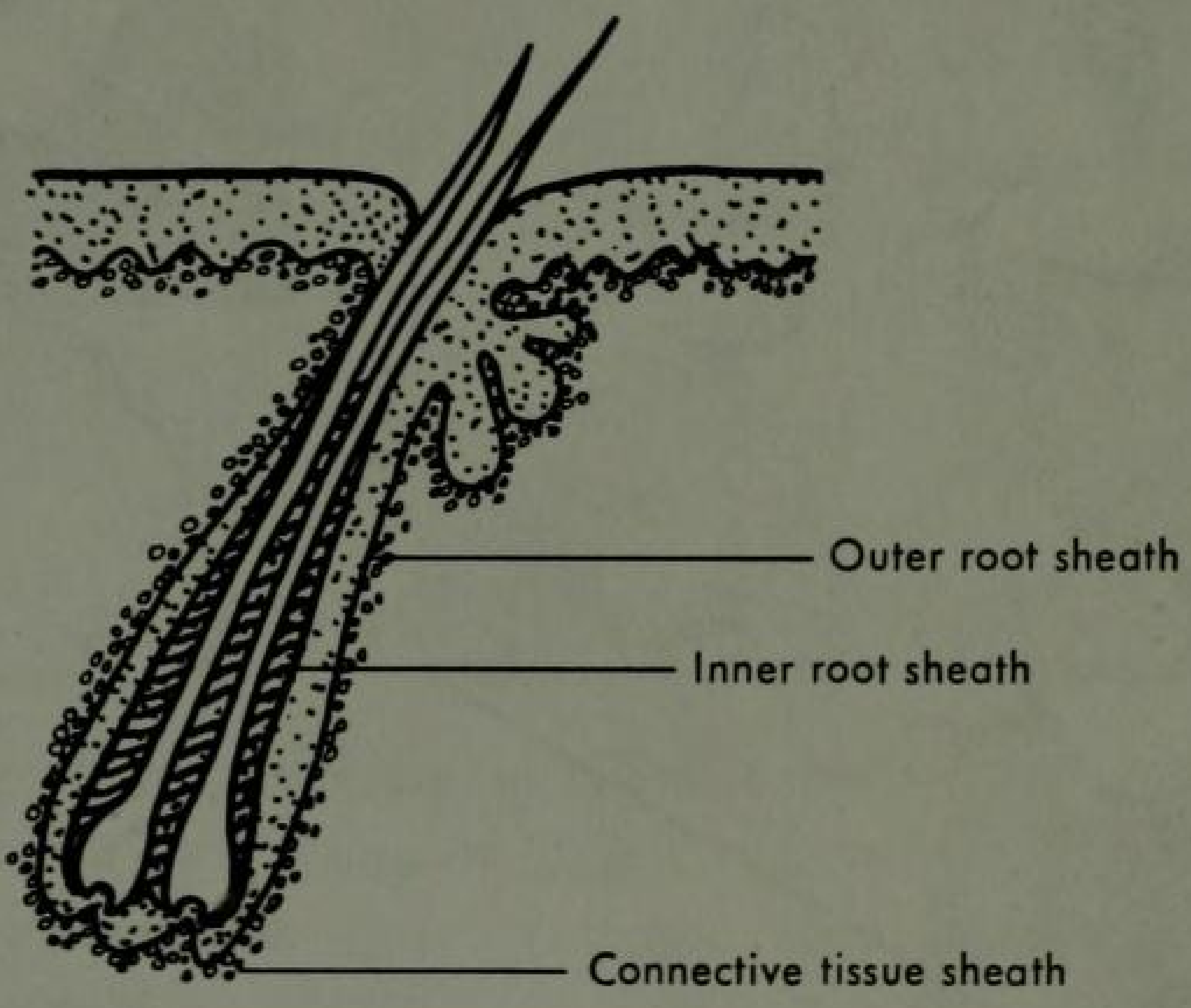

FIGURE 24. *Pili-multigemini–two hairs sharing one follicle.*

Chapter III

A Practical Analysis of the Hair and Skin

The practical content of this chapter is based on the principles of the shedding cycle discussed in the preceding chapter. However, to be of practical use to the student, some of the analyses we shall make must presuppose a certain familiarity with the application of currents to the follicle. If this book is being read in conjunction with a formal course on the subject, the instructor can assist you in making the epilations (removals) which the analyses call for. If not, you will not be able to make certain firsthand observations, but you should nevertheless have little difficulty understanding the interpretations being made.

This chapter will be of special assistance to you when working with the electrological technics discussed in Chapters VIII, IX and X, since our present purpose is to offer a guide for recognizing certain categories of hair and skin. These categories, as we shall see, often determine the method of treatment. Furthermore, your practical training actually begins in this chapter with instructions on how to insert a needle into the follicles of various types of hairs. This insertion skill is a prerequisite to the mastery of any of the technics.

The chapter is divided into two sections. The first deals with interpretations of the appearance of surface hair; the second provides an analysis of skin characteristics relevant to treatment.

SECTION ONE: INTERPRETING THE HAIR'S APPEARANCE

In the preceding chapter we examined the structures beneath the epidermis and the alterations which take place there. We observed that the follicle is an ever-changing appendage in its growth and replacement phases. To the electrologist about to insert a needle in a follicle, however, none of this is observable. All she can see is a hair projecting from a pore of the skin. The depth and cellular structure of the follicle is something she can only guess about. In a sense, then, the electrologist has to work "blind," since her object is to destroy tissue she cannot see. This is the point at which the art or skill of the electrologist comes into play.

To deal with her invisible target adequately, the electrologist must attain a "feel of the insertion," which will help her visualize what she is encountering beneath the skin. Many experienced electrologists feel they have developed a "sixth sense," for working beneath the surface, but they are unable to communicate it; they cannot explain to the student or to others in the field how they know what to do in the variety of circumstances they confront. Experience is the key factor in acquiring this special sensitivity, but it is our hope to provide you with certain facts that will enable you to develop this "sixth sense" sooner.

The first objective of the electrologist, of course, is the insertion of the needle to the full depth of the follicle or the dermal cord, depending on the stage of development. Reaching that depth requires a great deal of skill with the needle. We must therefore concentrate on the development of this skill before discussing the factors involved in interpreting the follicle structure.

How To Hold The Needle (Single Needle Technic)

Select a needle of .005″ diameter of medium length and install it, using your forceps or tweezers, into the needle holder electrode. Now you are ready to practice insertions. Gently hold the body of the electrode between your thumb and first finger as shown in Figure 25. Do not hold it like a pencil. Allow your third finger to rest on the patron's skin as a guide along which to slide the holder as you enter the follicle. Train your first *two* fingers to do the inserting. Do *not* use a wrist action, and

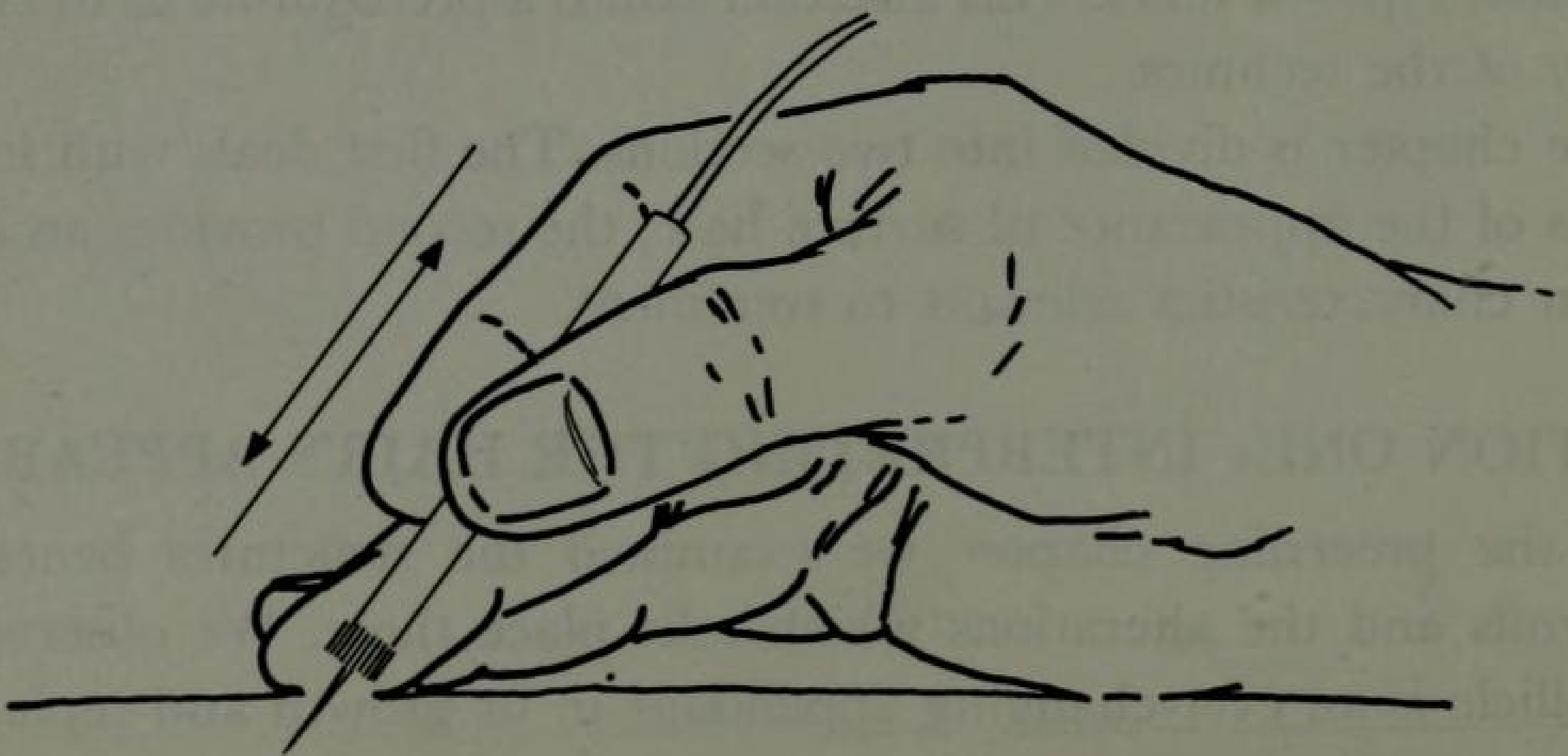

FIGURE 25. *How to hold the needle electrode.*

do *not* make elbow or shoulder motions when making insertions. The highest degree of sensitivity of touch will be achieved this way.

Practice on a piece of newspaper over a folded towel or dry cellulose sponge, inserting into all the letter "o's," "e's," and "a's" until you have developed the necessary skill. This should be done under magnification similar to that which you intend to use for patron work. A straight forward insertion will not bend the needle. If you press sideways or up or down you will bend needles. Practice with .005″ diameter stainless steel needles first, then .004″, then .003″. Anything smaller is not stiff enough to readily penetrate newspaper.

A smooth steady insertion, not too slow nor too fast, is what you should strive to achieve. Do not jab as if you were a nurse giving an injection, because you will fail to develop the sense of touch needed to discover the structure of the follicle. Visualize the path of the needle, pretending you are a passenger on its tip. With practice a rapport will develop and you will "see" through your sense of touch.

Inserting Into The Hair Follicle

ANGLE OF INCLINATION

Most hair grows at an angle to the surface of the skin, that is, more horizontal than vertical. Sketches throughout this book, while showing the follicle as somewhat inclined, do not present the true angle most usually encountered, mainly because of the problem of labeling something so steeply angled. This graphic inaccuracy appears in nearly all medical and cosmetology books treating the subject. The following diagram shows the true angles of growth for typical hairs in various regions:

In Figure 26 the angles of inclination shown apply in a general way to the average straight hair case. Exceptions to this will run all the way from perpendicular and reverse angle to absolutely flat, but that is the unusual and not the norm. If the hair is oval or flat in cross-section the

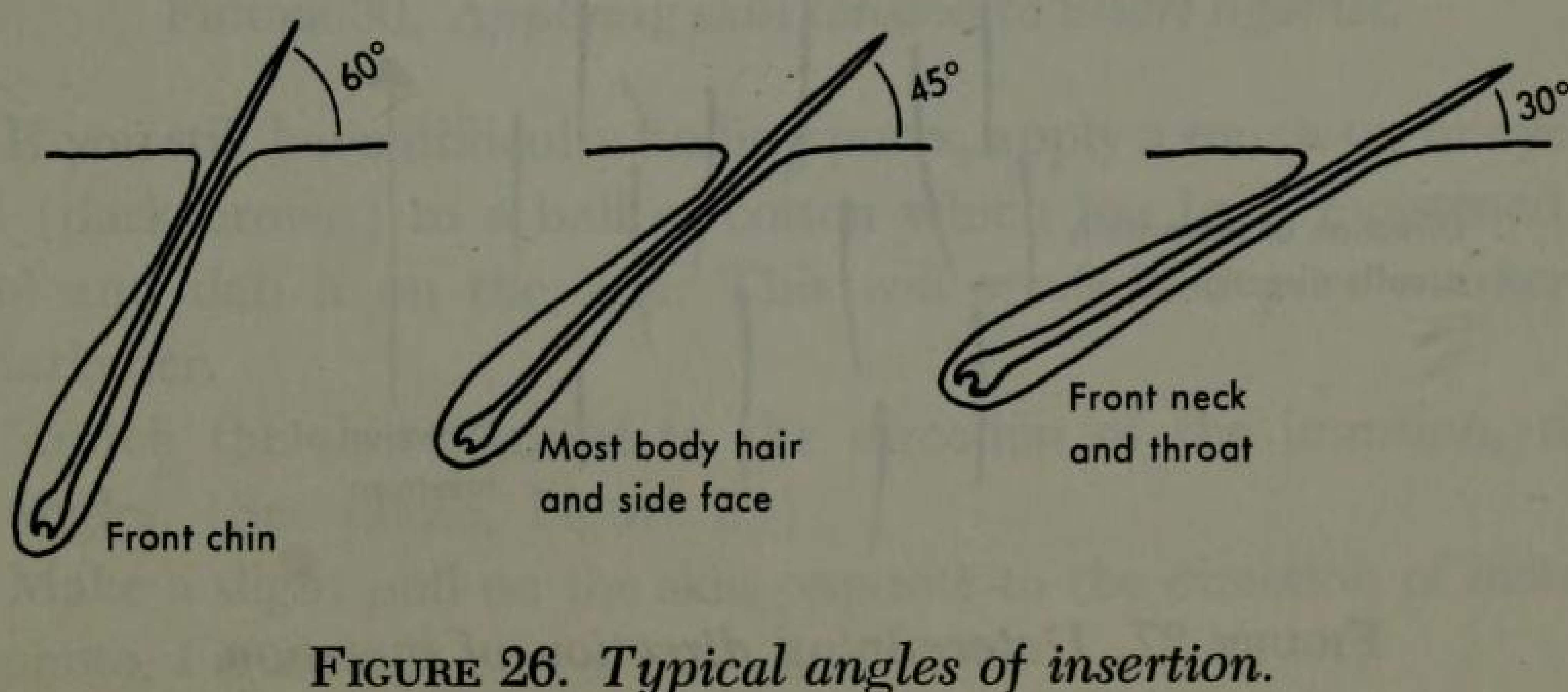

FIGURE 26. *Typical angles of insertion.*

follicle will be curved in varying degrees (see page 67) and you must compensate for the curvature by anticipating the follicle curve and inserting at a steeper angle than the hair indicates. Your anticipation of the angle of inclination can only be developed through close observation of epilated hairs and much practice.

DIRECTION IN THE HORIZONTAL PLANE

Properly sliding the needle into the follicle requires aiming the probe in a direction parallel to the hair root. Therefore, we must take into consideration not only the angle of inclination but also the direction in the horizontal plane. For example, the direction of most hairs on top of the forearm is downward, toward the hand. The needle must be inserted parallel to this direction in the horizontal plane or it will be wide of its mark. Observe all the hairs in an area the size of a quarter, let the direction shown by the majority of the hairs be your guide for insertion in that area. Be sure to direct your attention to the surface of the epidermis and follow the angle of the protruding hair as it appears at the pore level.

Now that we have established our direction and our angle of inclination insert the needle on the underside of the hair and slide it slowly and deliberately into the follicle alongside the hair root. (Now get your volunteer back on the table and try again.) If a proper insertion has been made, the patron will experience no pain whatsoever. If she feels a piercing or "sticking" you have misjudged one or both of your insertion angles.

Hints For Making Good Insertions

1. Highlight the hair by shining your light from one side.
2. If the skin proves too shiny to permit careful scrutiny, apply a thin film of calamine lotion to dull the sheen of the skin.

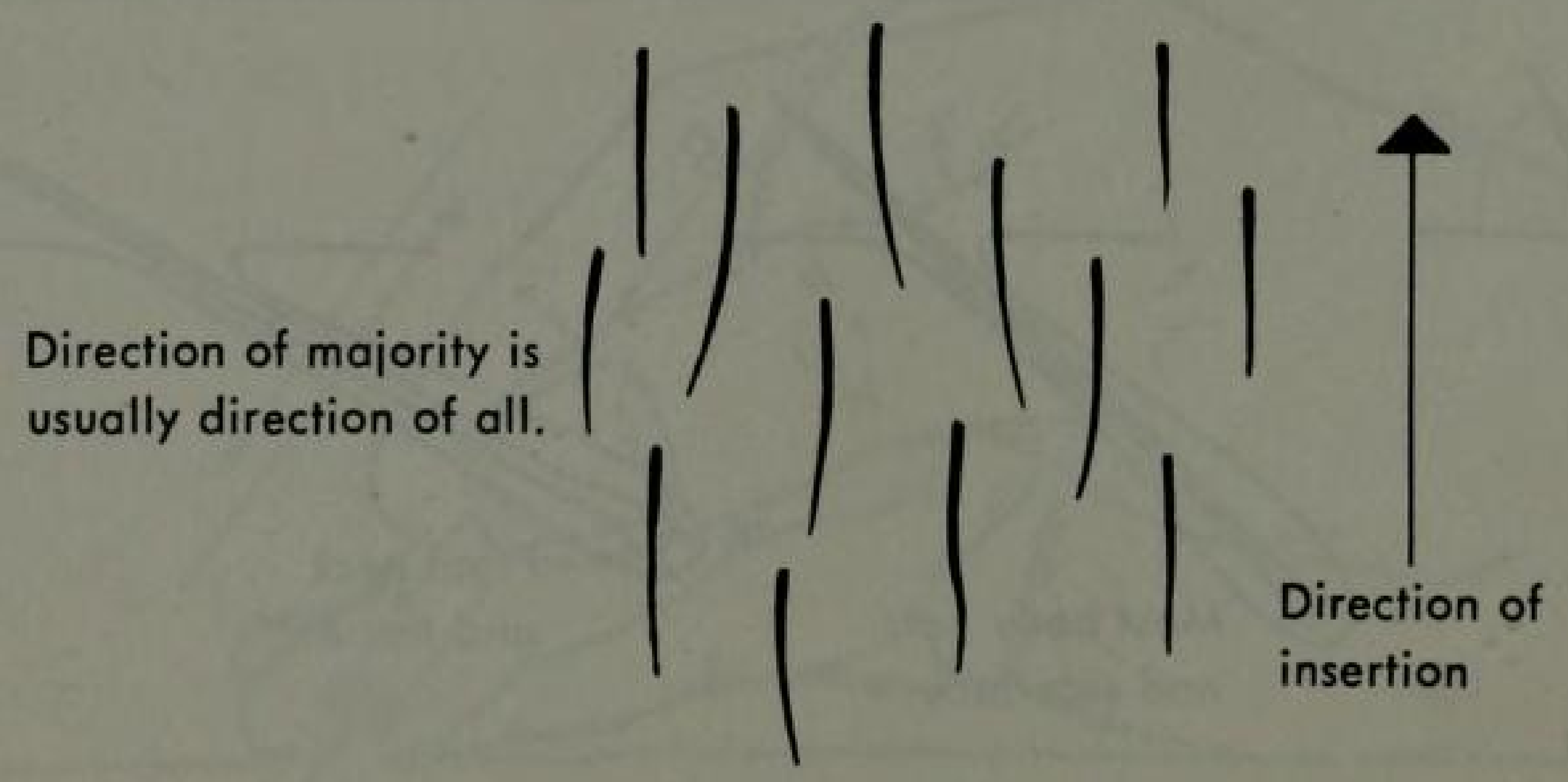

FIGURE 27. *Determining direction of insertion.*

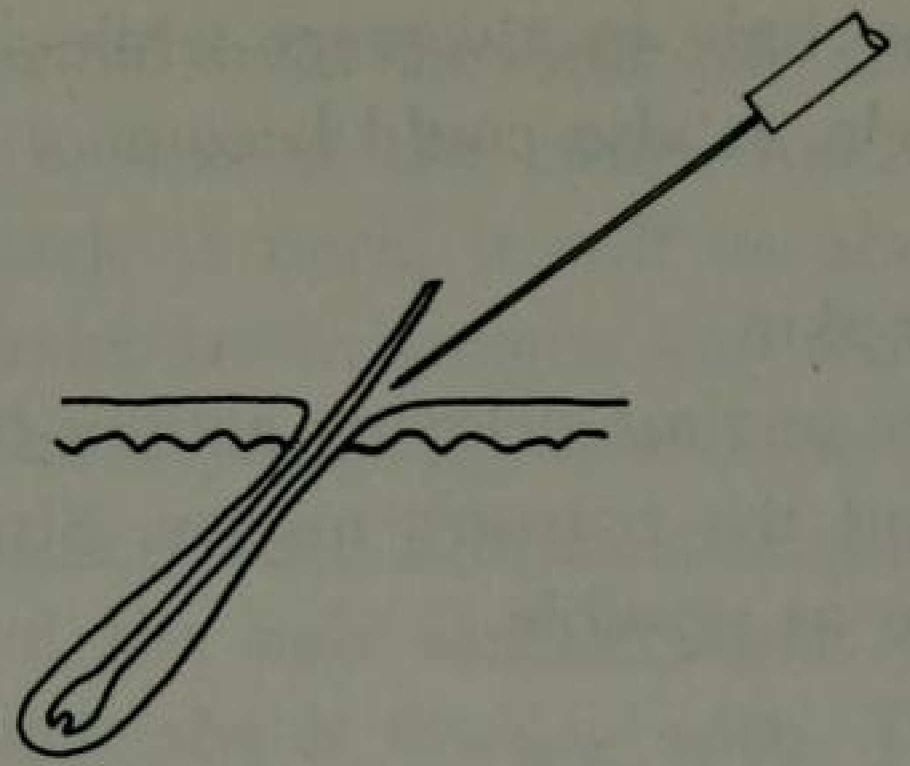

FIGURE 28. *Insert on underside of hair.*

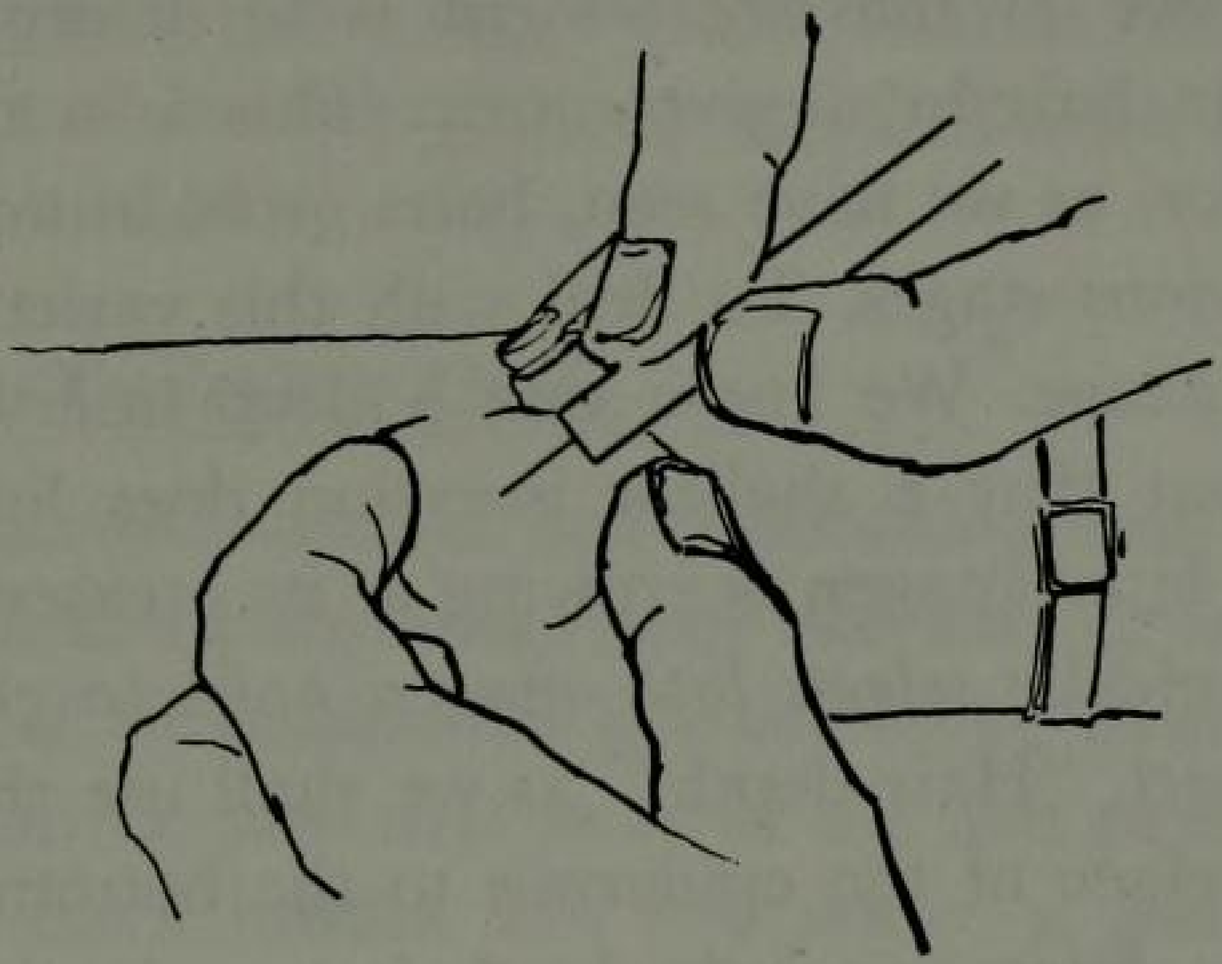

FIGURE 29. *Stretching skin between two fingers.*

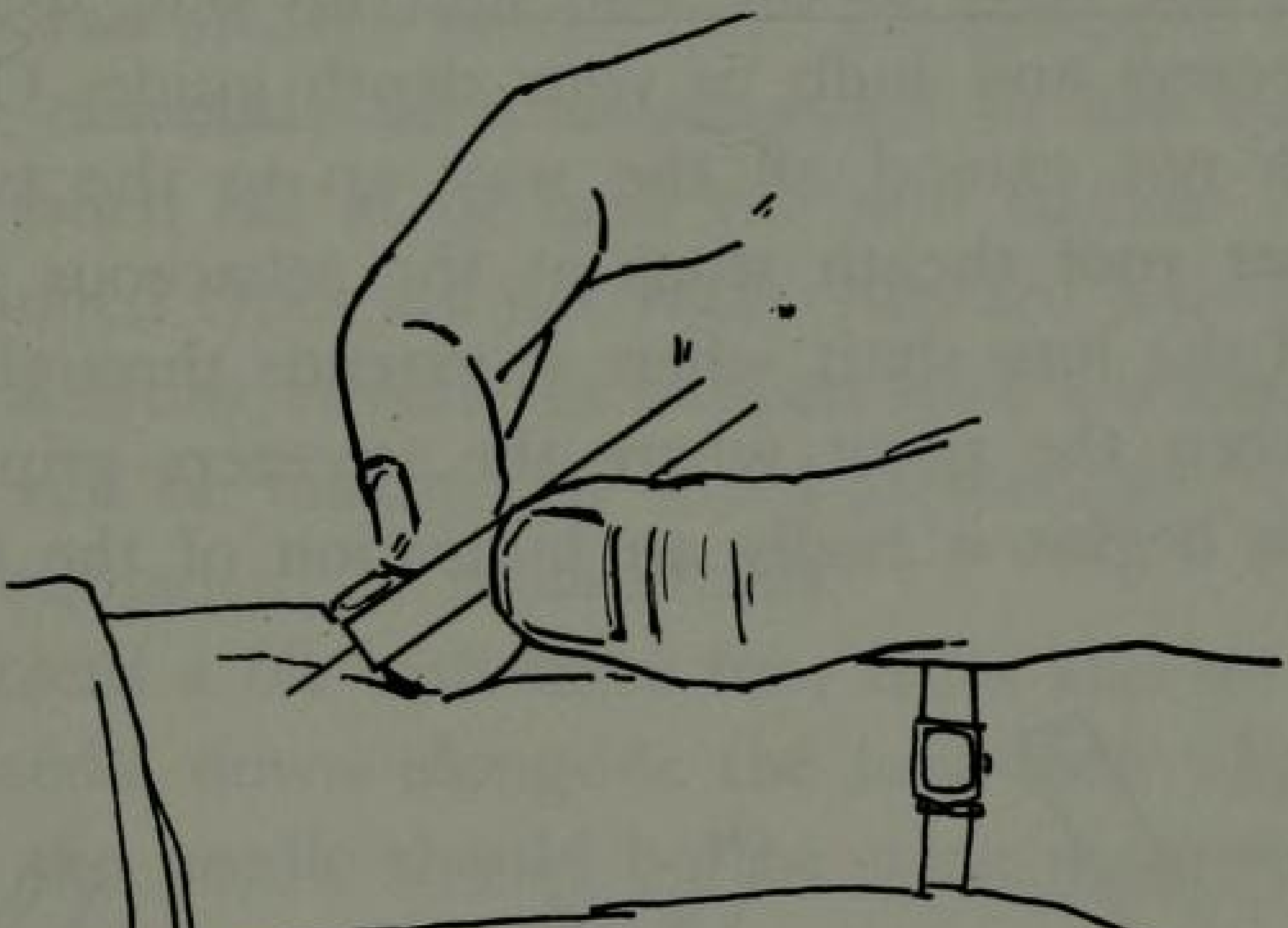

FIGURE 30. *Applying skin tension to insert against.*

3. If you still have difficulty finding pores, apply a touch-up or eyebrow pencil (dark brown) to a ball of cotton which has been moistened with alcohol and dab it on the skin. This will serve as a pore marker and hair darkener.

4. Stretch the skin parallel to the direction of the insertion, not at right angles. (See photo, Figure 29)

5. Make a slight pull on the skin opposite to the direction of insertion. (See photo, Figure 30)

6. Do not hold the hair in tweezers while inserting; this tends to change the follicle angle. It also could become a habit that would cause you to work slowly.

7. Do not pinch the skin.

8. Any little motions or time-delaying actions between insertions tends to waste your time and the patron's money. Strive to develop efficient working habits as soon as possible.

Establishing A Depth Gauge

The first objective of the electrologist is to determine the depth at which to treat the hair in a given area. This is a major problem to the electrologist, for, as we have seen, hairs grow in any area at varying depths and in various stages. To deal with this variety the electrologist requires a depth gauge. We know that a deep insertion can destroy a shallow follicle, but that a shallow insertion does little to the deeper follicles. A hair in later anagen is growing at its greatest depth; therefore the electrologist logically *selects late anagen hairs to gauge the depth to which she will insert.* "Hair depth," as we shall use the term is the distance from the surface of the epidermis to the bottom of the bulb.

An easy way to determine hair depth is to grip the hair shaft with your tweezers at the level of the skin and lift out, using the distance between the tweezers and bulb as your depth guide. Observe that the root sheath does not extend all the way up to the tweezers. This is because the inner root sheath stops at the sebaceous gland duct; no sheaths surround the hair shaft where it extends through the epidermis. This space between the point where the tweezers grip and the point where the sheath begins is really an indication of the thickness of the

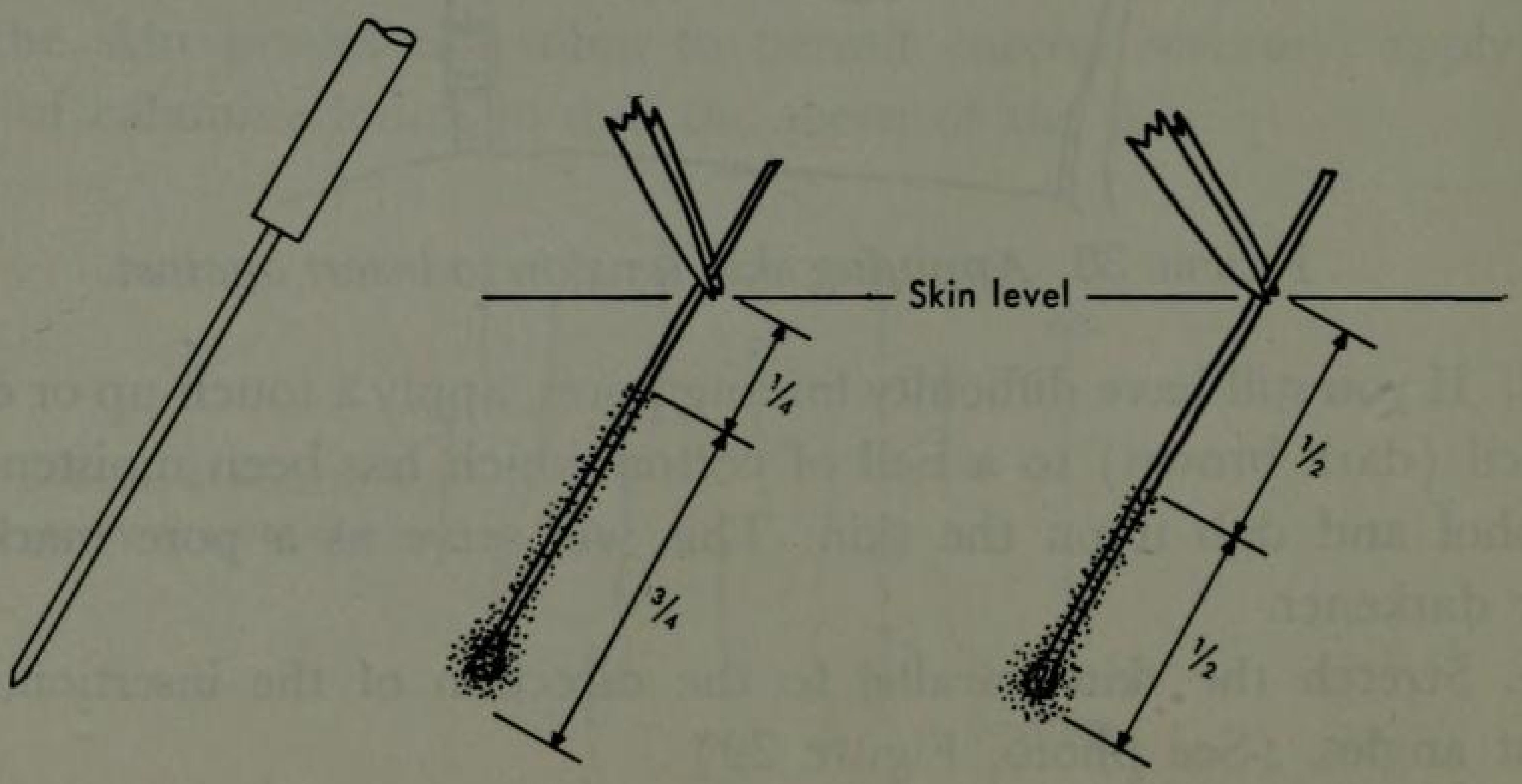

FIGURE 31. *Grip hair at skin level to gauge depth—compare with needle.*

epidermis. In thin epidermal areas the clear hair shaft space of an anagen hair will be about ¼ or less of the entire root length while in thick epidermal areas e.g., back of neck, it will be about ½ root length.

Determining which hairs are in anagen and which are in other stages is a further problem. The depth gauge is of little assistance if the wrong stage of hair is used as a guide. The electrologist must be able to tell from the appearance of the hair and to some extent the feel of the needle, what stage of hair she is dealing with. These appearances will vary according to the ways the hair has been treated by the patron. Tweezing, shaving and other methods of removal or neglect each produce a different set of characteristics to watch for. Each of these possible situations must be studied.

Interpreting The Tweezing Case

Always ask a patron what she has been doing with her hair problem if it is not obvious. If a patron has been tweezing or waxing consistently and for purposes of treatment has allowed some hairs to appear above the surface, you can be sure that most of the hair showing is in anagen. If they are dark, thick bristles and you notice a pointed unpigmented tip, they are making their initial appearance (A and B, Figure 32). If the ends are squared off, the patron must have clipped them (C, Figure 32). If she has obviously been unsuccessful in her tweezing attempts the hairs are mashed off at or near the skin surface (D, Figure 32). These last mentioned types are not really tweezed hair at all but merely hairs cut off by a strong tweezer or clipped with a scissors, and therefore these hairs may not be making an initial appearance; they could be in any stage of development or replacement.

Let us experiment a bit with these four hairs and see what we "feel" as we slide a needle down alongside the hair root. (For easy insertion the diameter of the needle should be the same diameter as the base of the hair.)

Hair A. Hair A is a newly formed hair, as evidenced by its point, and is being held in place by a tender root structure. Since it is in early

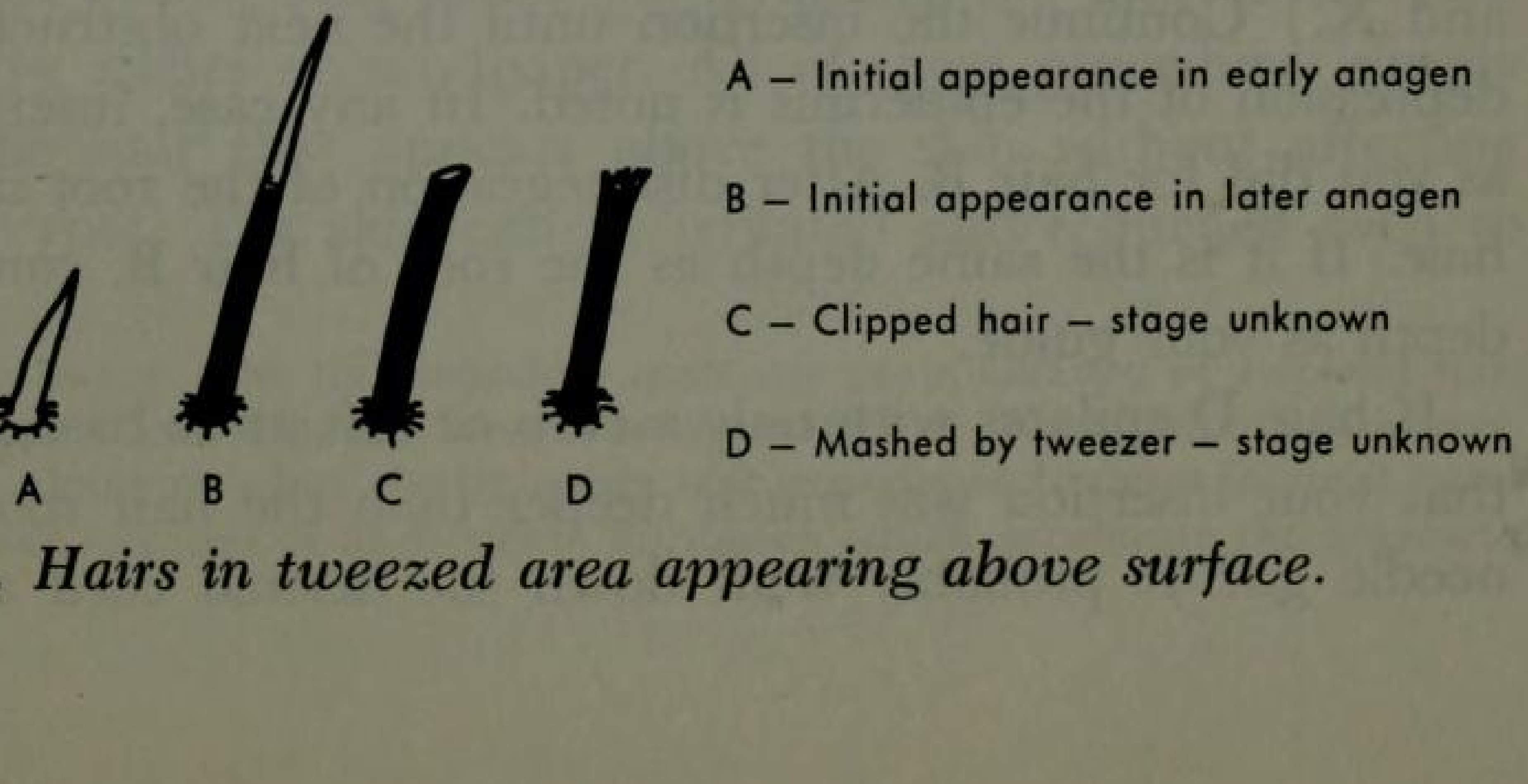
A – Initial appearance in early anagen
B – Initial appearance in later anagen
C – Clipped hair – stage unknown
D – Mashed by tweezer – stage unknown
A
B
C
D

FIGURE 32. *Hairs in tweezed area appearing above surface.*

anagen it is still not very deep. The needle will slide easily into the follicle entrance and with no pressure whatsoever will slide to the bottom of the follicle. If the needle has a rounded tip the mouth of the follicle will, in most cases, depress slightly when the needle hits the bottom. If the needle has been properly placed, electrical action will release the hair root from the follicle bottom.

Hair B. Hair B is also making its initial appearance, as we can tell by the pointed tip, but since it is ¼ inch above the skin surface it has obviously been growing for a longer time than hair A. The ease of insertion will be the same as for hair A and the electrical disintegration of the follicle will release the hair. However, though the diameters of A and B are the same at skin level you will find hair B more deeply rooted because it is in a later stage of anagen.

Hair B is the ideal type for the electrologist to select when starting a treatment. You know it will have a root. That root depth should be used as your guide for the depth of your needle insertion in subsequent follicles whose hairs are of the same color tone and shaft diameter.

Hairs C and D. Hair C, because of its squared cut off shaft and Hair D, because of its mashed tip do not reveal how long they have been in existence. Obviously the patron has not been able to pull them out due to the tenacity of their root structure. Either the tweezers slipped and she has resorted to clipping or else the tweezers broke off or mashed the hair shaft. These hairs could have been growing for several months. Hairs which have resisted tweezing must be very firmly held in place. Their root sheaths are tough and as in the usual case the top portion of the sheath just below the sebaceous gland duct is quite dry, firm and tenacious.

In attempting to slide the needle alongside these hairs we will hit a definite obstruction when we reach the inner root sheath. We will observe the skin depressing in a slight dimple but we note that we are only about one-fourth as deep as we were when inserting into the follicle of hair B. Slight pressure must be used to get past this stoppage. (Galvanic current would solve this problem as we will explain in Chapters VIII and X.) Continue the insertion until the next obstruction is felt or the depression of the epidermis is noted. In any case, insert at least as deep as you did for hair B. After disintegration of the root sheaths epilate the hair. If it is the same depth as the root of hair B, continue to use that depth as your guide.

ee fig 32

If hair D epilates with only a club or tuft at its base, it will be obvious that your insertion was much deeper than the hair root. Where did the needle go? It probably went down the dermal cord and the electrical action took place in tissue that is preparing to produce the next hair. If the current was adequate that follicle should never regenerate. The epilation of a club type hair does not at all indicate failure. Concentrate on what you have done beneath the skin; do not attach your moments of joy and sorrow to the appearance of the epilated hair.

In viewing the tweezing case you are only seeing a small portion of the total amount of superfluous hair the patron possesses. If the patron has been tweezing deep coarse hair once each week you are viewing approximately one-fifth or one-sixth of the total amount of deep coarse hair that the patron has. If the patron has been tweezing medium depth hair once each week you are viewing one-sixth or one-seventh.

The following schedule provides an approximation of the time for each type of hair to reappear after tweezing. Although no such schedule could be wholly accurate, it will aid the electrologist to anticipate the appearance of presently-unseen hairs, when the patron has been tweezing or waxing. Regrowth from tweezed follicles returns faster than it does from follicles which have naturally shed.

Average time of hair reappearance after tweezing or waxing*

Deep, coarse, bulbous terminal hair (as on chins)	5 to 6 weeks
Medium depth terminal hair (as on side of face and body)	6 to 7 weeks
Medium depth intermediate or accelerated lanugo hair	7 to 9 weeks
Shallow lanugo hair (downy, general face)	8 to 10 weeks

Since most tweezing cases involve types of hair ranging in size from lanugo to heavy terminal hair, the electrologist must anticipate the reappearance of these various types at different times. The deeper, darker hair is the quickest to reappear after tweezing. The remaining types will reappear at times relative to their depth, as the schedule indicates.

Interpreting The Shaving Case

Any case in which a patron has been removing superfluous hair by means other than tweezing or waxing shall be referred to as a "shaving case." She may be shaving or clipping, using a depilatory which is merely dissolving the hair at the skin surface or grinding the hair to the skin level with abrasive stones or sandpaper. All of these procedures simply do away with the hair that appears above the skin without affecting or disturbing the root. The skin can be irritated and reddened even to the point of eruption, but the stage of the hair's development will not be materially changed.

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*The authors are aware that this schedule indicates reappearance of tweezed hair in less time than medical investigators have recently stated. It is our opinion, however, that the schedule is closer to what electrologists will experience because in most cases their patrons will have excesses of androgenic hormones which accelerate the regrowth process.

Viewing the shaving case you will be able to see all the hairs except for that 10 to 20% that have recently shed. *Remember, there is always a percentage of hairs not visible.* (The amount not in view will vary between areas on the same person as well as between people. Hereditary background, race and climatic conditions all seem to affect this percentage factor.) The electrologist should observe that while these hairs are all very short there will be some variation in length, color and diameter which can provide a great deal of information. Assuming that the patron did not shave, etc., for 48 hours and that we are looking at a chin growth on a middle aged woman we might see an assortment of hair as shown in Figure 33.

Hair A has grown the longest since the last shaving period and therefore is obviously an active growing hair in some stage of anagen. If we were to slide a needle alongside this hair we would note some resistance at the beginning of the inner root sheath level but should push past it to the follicle bottom. Inducing an electrical action in the needle to disintegrate the sheath attachment should epilate the hair with a complete root structure.

Hair B is making its initial appearance and has emerged since the last shaving. This hair is identical to the first hair discussed in the tweezing section. It is in an early stage of anagen.

Hair C is the same diameter as Hair A but is a lighter color. It is not growing so fast, so it must be in its shedding cycle and is no longer attached to the papilla. Its source of nourishment is poor, hence its slow growth (catagen) and lighter color. A needle sliding down alongside this hair will meet with an obstruction requiring that you push on past to the same depth as hair A or B. The current's action will not release this hair too well and a slight pull or traction on the hair will

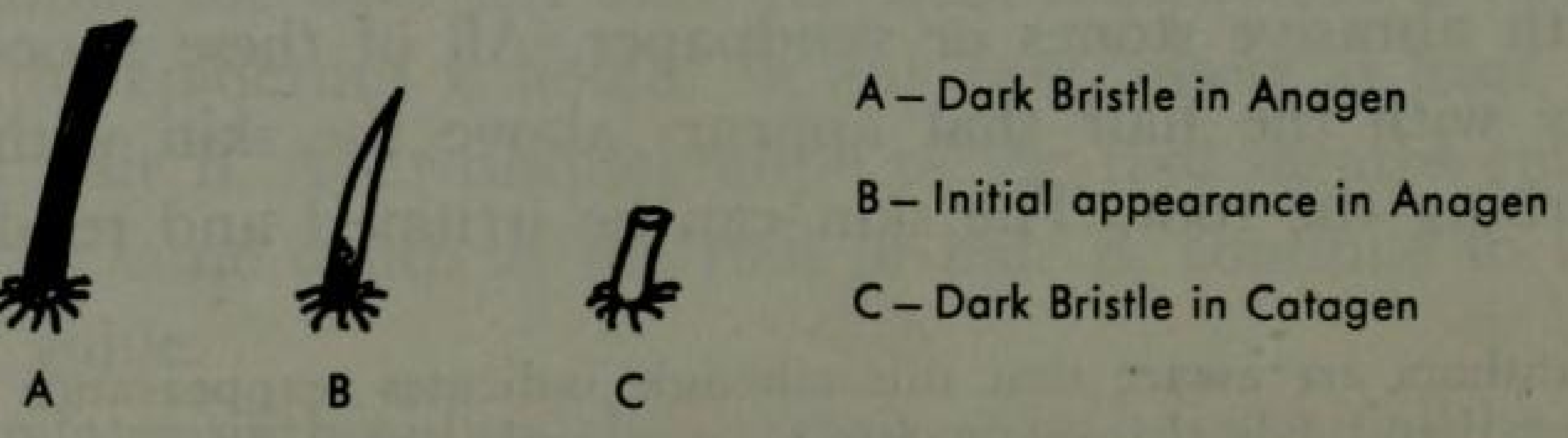

A
B
C
A – Dark Bristle in Anagen
B – Initial appearance in Anagen
C – Dark Bristle in Catagen

FIGURE 33. *Hair in shaved area.*

be necessary to epilate it. In observing its root you will note that it is not complete; the lower bulb may be missing or there may be nothing but a dry tuft on the end.

While the appearance of this hair root did not make us happy let us hope our current destroyed the tissue capable of producing another hair, since we inserted into the follicle cord therefore applying the current to the full range of hair germ cells, from which all future growth will come.

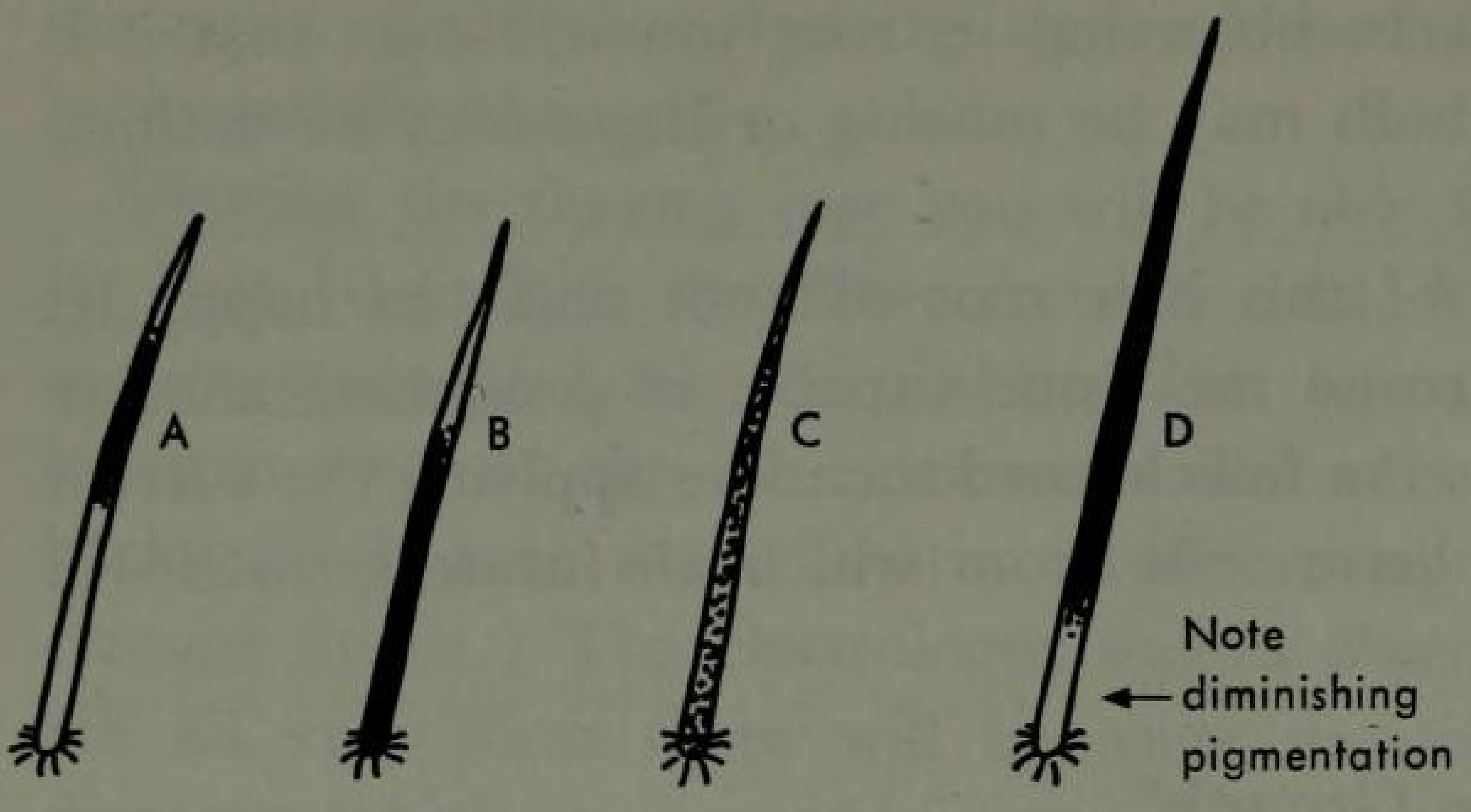
Interpreting The "Virgin Growth"

The term "virgin growth" applies to a superfluous hair condition that has not been tweezed, cut or tampered with in the previous 8 months or longer. It is not often that a patron with a face problem will present such a growth, but every now and then the electrologist encounters someone who is afraid she will make the problem worse, refusing to do anything to her facial hair. Usually, however, if a woman has an undisturbed hair growth, it appears on some area other than the face.

On women, forehead hairlines and necklines are usually of the virgin growth type. Most arm cases and some thigh cases are in this category. On men, most back, shoulder and chest hair is of the virgin type unless occupation or dislike of hair has caused them to shave the area.

In viewing the virgin growth the electrologist will see hair of all different lengths and shades or tones of color. For instance, a patron with black hair will exhibit hairs in shades of black from black-black to brown-black. In almost every case the deeper the tone, the deeper the follicle will be at a given stage of anagen. Patrons with brown, red or blonde hair also will show this same relationship of color tone to root depth. If two hairs are one inch long and one is a darker tone at pore level than the other, it will probably have a deeper root. The only exception to this is, of course, dyed hair.

Natural gray hair is always deeper in its last stage of anagen than X are neighboring hairs of the patron's original color. 6 Always expect to insert deeper when entering a follicle containing a gray hair. In the early anagen stage the emerging hair almost always appears at the patron's original color. Then, after it grows longer and the root becomes deeper, it loses its pigmented appearance either because it is no longer able to pick up the pigment or because, as some writers believe, it acquires entrapped air bubbles which obscure the color. Regrowth of gray hair, after tweezing or treatment, often perplexes the patron and the operator with its early coloration and causes them to wonder if new hairs are coming in.



A – Gray hair in late anagen—note pointed tip and pigmented section.

B – Dark pigmented hair in late anagen—note pointed tip and that diameter and pigment is uniform from tip to base.

C – Lighter pigmented hair in late anagen—note diameter and pigment is uniform from tip to base.

D – Dark pigmented hair with diminishing diameter and pigment. This usually indicates the shedding process (telogen).

FIGURE 34. *Virgin hair as it appears above the surface.*

Virgin hairs will all exhibit pointed tips unless they have been worn, broken or cut off. Figure 34 shows how several normal virgin types will appear. Since some will be duplicates of hairs that we discussed under other headings, we will discuss them only briefly.

Hair A. This is a gray hair, having a point showing some minor pigmentation which diminishes to gray at the skin level. *This hair, being in an advanced stage of anagen, is a good hair for our depth-of-insertion gauge.* It will epilate showing a complete root structure.

Hair B. This is the same as Hair A except for pigmentation.

Hair C. Because it is lighter in overall color from tip to base, Hair C is not as deep-rooted as Hairs A and B. Do not insert so deeply in this follicle and expect to epilate the hair a little sooner.

Hair D. This hair represents the majority of virgin body hair because it is in telogen. Insert to depth of Hair A or B. You will note some traction on epilation and no root structure other than a dry tuft because it is a club hair.

Interpreting The "Curved Follicle" Growth

Our consideration of hair growth and follicles up to this point has been concentrated on straight hair. Everything that has been said about straight hair concerning the hair exchange and replacement cycles is also applicable to the "curly" or "kinky" type of hair. There are, however, specific differences which present problems to the electrologist until they are understood.

Curved follicles are found on light as well as dark skinned people. Some Negroes and dark skinned patrons have straight facial hair with round hair shafts and some light skinned patrons will have some curly facial hair with flat oval hair shafts. Normally, however, the majority of patrons with kinky superfluous hair are Negroes.

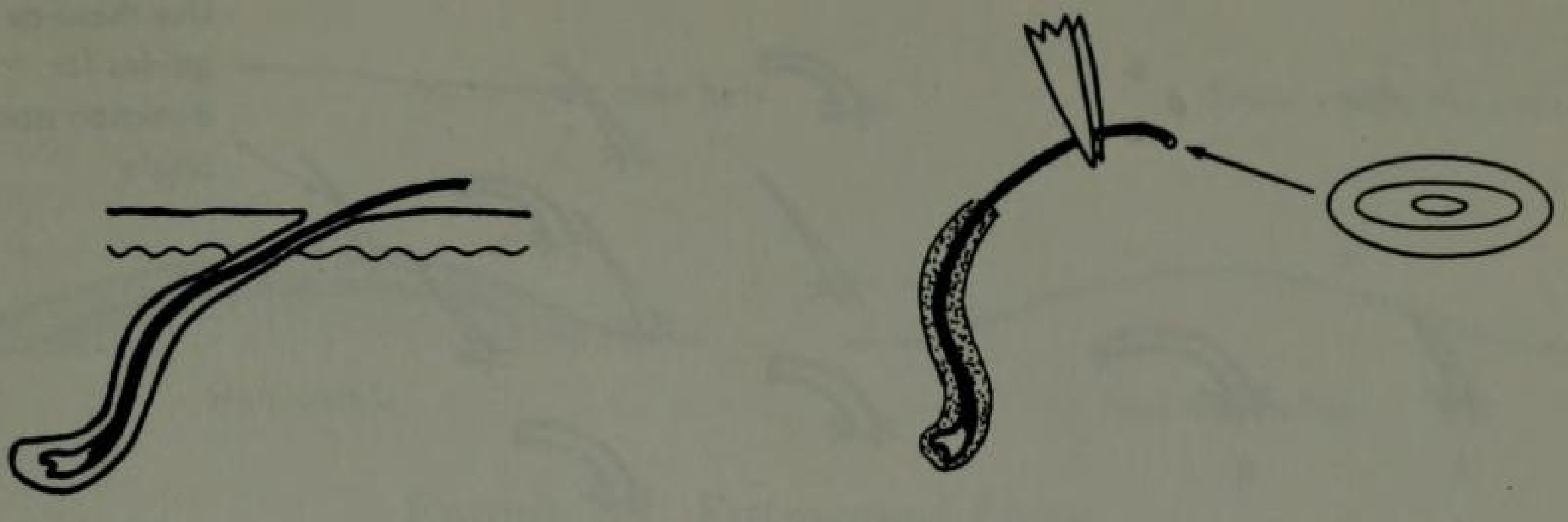


FIGURE 35. *Hair and follicle shape on average curved follicle with flat hair, as found on usual Negro patron.*

The degree of follicle curvature is related to the flatness of the hair shaft. Round hair always emanates from straight follicles, oval hair from slightly curved follicles and flat hair from more greatly curved follicles. The flatness of the hair determines, in turn, the degree of kinkiness of the hair. These curved follicles do not exist in the shape pictured in cosmetology textbooks where they are shown forming a complete letter "C." A hair with this degree of curvature would be an abnormal type usually observed around scars from wounds or injuries that have been sutured. A few of this type along with "corkscrews," "tombstones" and other anomalies are usually encountered toward the termination of a heavy face case.

In most curved superfluous hair cases it will be noted that the lower fourth of the follicle turns at an obtuse angle from the follicle proper. Montagna states that this angle is the cause of the flattening of the hair shaft structure. It is the flattened shape which gives rise to the curling of the hair shaft. Careful observation over a period of many years with hundreds of patrons has revealed that the curl of the hair above the skin level is greater than the follicle curvature in the skin. Apparently because the portion of the root encased in the root sheaths is still in a moist and newly formed condition, the hair does not begin to curl until the hair has left the sheaths and begins to dry. Just as a wet strip of paper curls as it dries, the hair you see above the skin level acquires more of a curl that the root below.

Figure 36 shows how various hairs from curved follicles appear at the surface. In the early stages of anagen the emerging hair (A) will appear with a pointed tip and be almost round and straight Sliding a needle alongside this hair will meet with no obstruction until the follicle bottom is reached. After electrical disintegration of the root sheaths this epilated hair will exhibit a straight root structure and be only about half as long as it would be in later anagen.

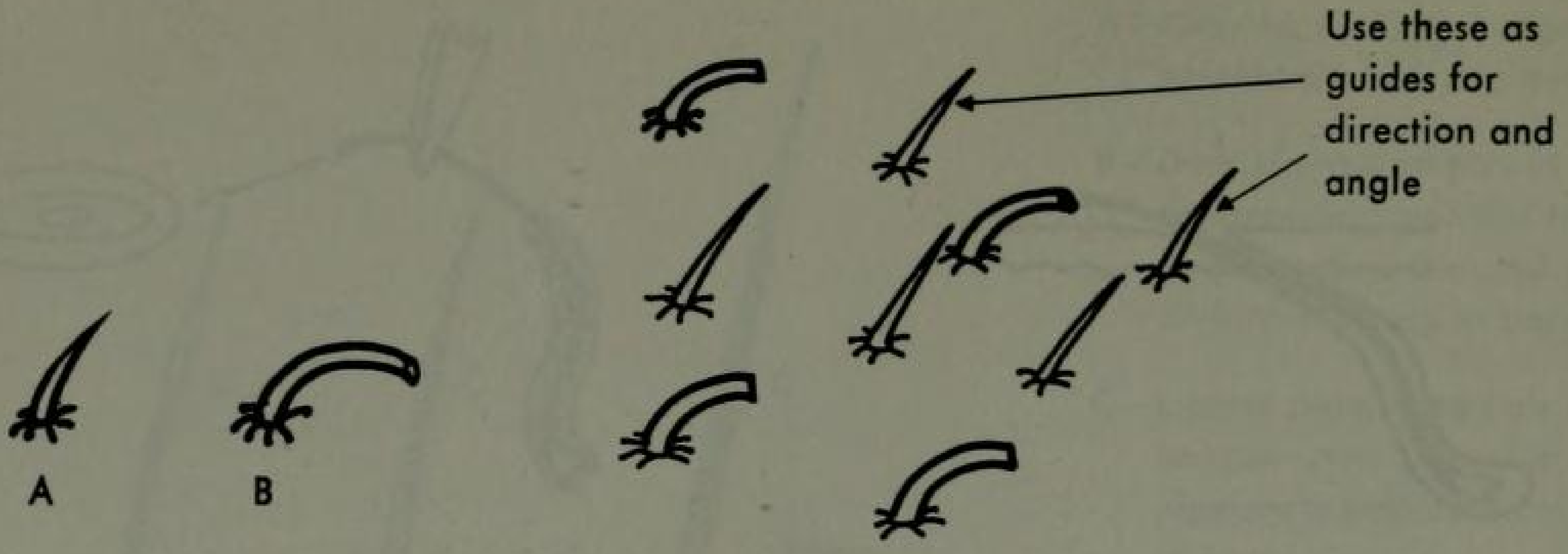


FIGURE 36. *Appearance of hair from curved follicles.*

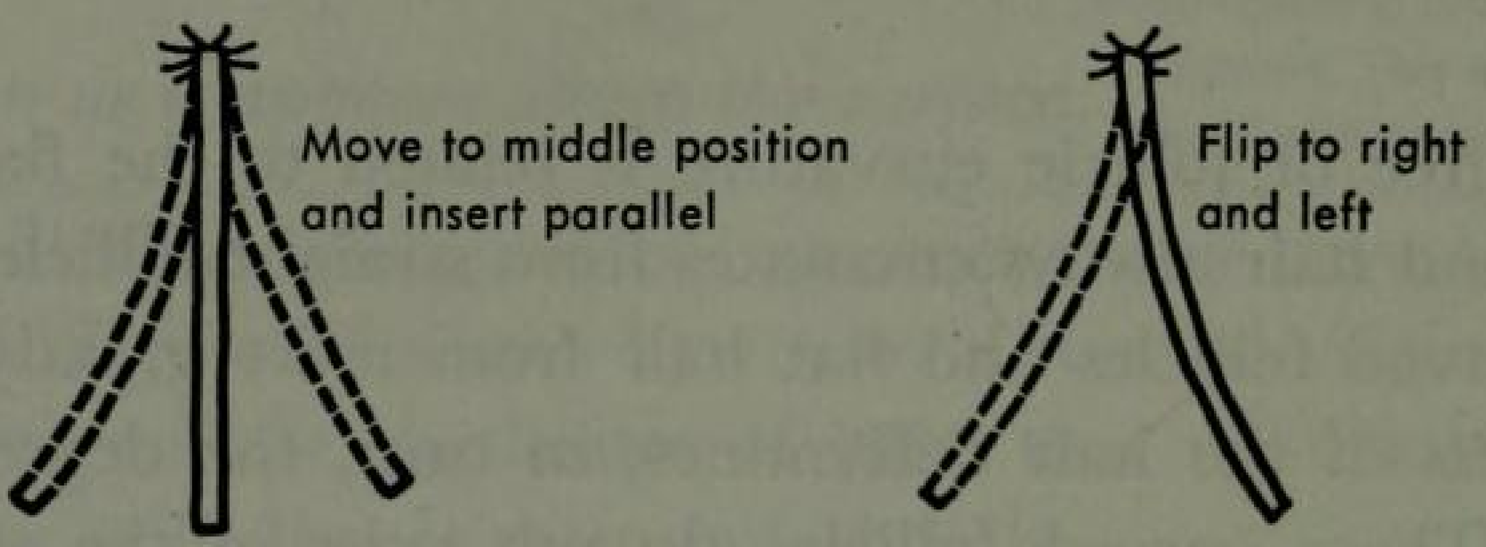


FIGURE 37. *Determining direction on curved follicles.*

Hair B could be in any stage of development from late anagen to telogen depending on whether this patron has been cutting, shaving or tweezing. In any case this hair will have a curved follicle which requires special consideration to be inserted into properly. Introduce the needle probe on the underside of this hair at the same angle at which neighboring lanugo or emerging terminal hairs are growing. Push past the tissue obstruction and continue downward about half again as far. When the hair releases, check it for depth and continue using the depth as your guide. Always use a well-rounded point and a needle diameter that equals that of the widest part of the hair shaft.

When the hairs have grown beyond ¼ inch long, a special method must be used to insert in the proper direction. Take your needle or tweezers and flip the hair to its opposite side as the dotted line shows in Figure 37. The true direction of the insertion is the bisection of the angle between the two positions. Move the hair to this middle position and insert on the underside of the hair. Little difficulty should be encountered.

Hairs that are entrapped and ingrown as shown in Figure 38 have to be dug out. It is very difficult to insert alongside these ingrown hairs especially if they are infected and inflamed. For the time being it is better just to free the trapped end and cut the shaft short so that the epidermis can heal around it. When the epidermis has healed treatment may be administered. Tell your patron to do the same and never

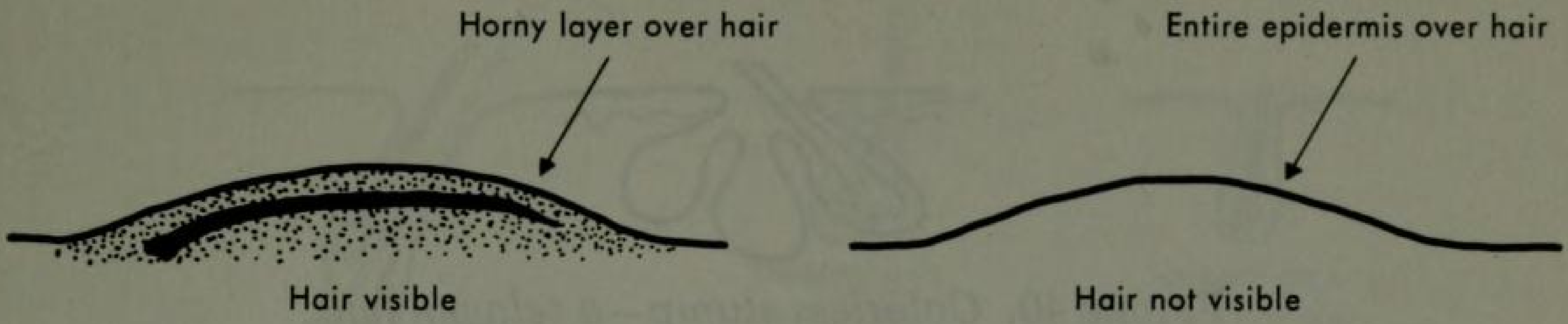


FIGURE 38. *Entrapped hairs.*

to tweeze these entrapped hairs. Tweezing an infected follicle allows the pore to heal closed, and only tends to worsen the problem.

Hair problems of the curved follicle type are very tedious and time consuming; however with a little patience and practice excellent results are possible.

Unusual Hair Growths

In an attempt to cover as completely as possible all the various types of hair growths encountered by the electrologist we must include several anomalies which crop up from time to time.

LANUGO COMEDOMES (TRICHOSTASIS SPINULOSA OR BUNDELHAAR)

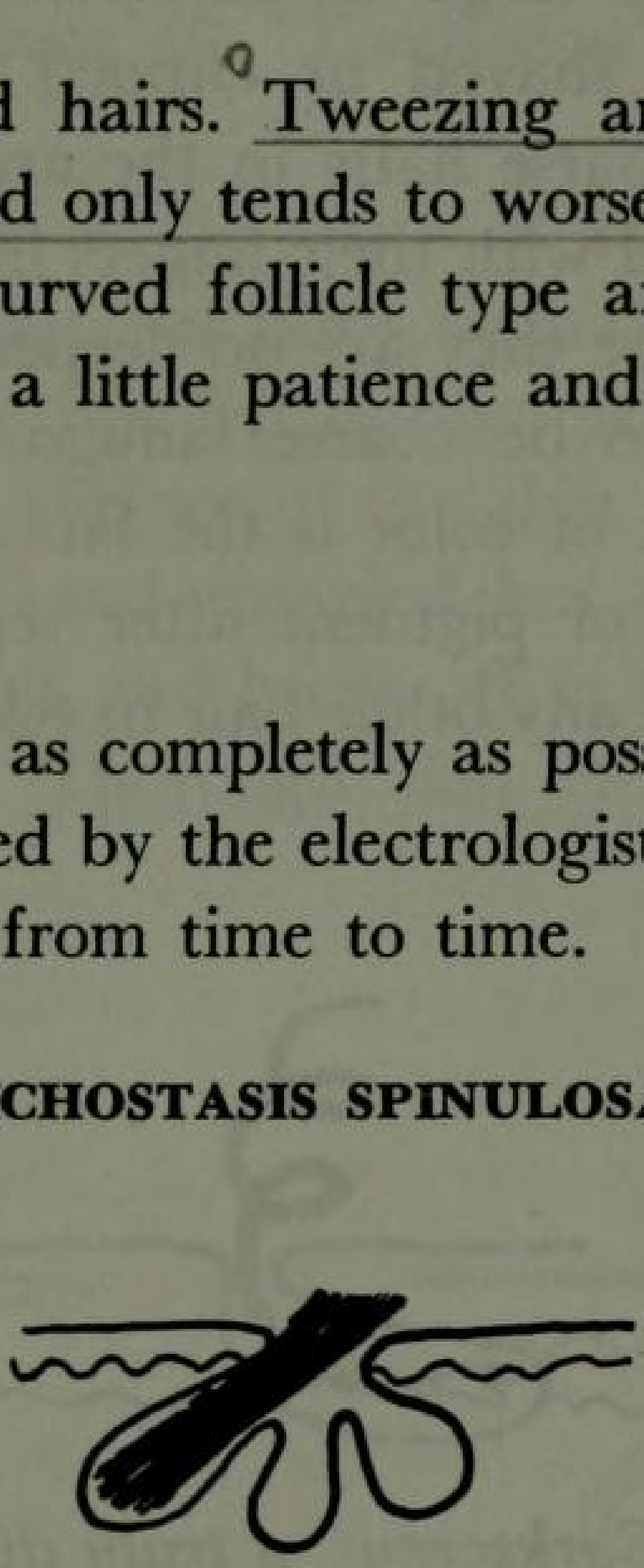


FIGURE 39. *Lanugo comedomes.*

A lanugo comedome is a bundle of tiny lanugo hair protruding from a follicle. At first glance it appears to be a short thick brownish hair, but upon investigation you will note that it can be tweezed from the pore without traction. If you were to observe it under a microscope you would find a bundle of many very fine lanugo hairs held together by sebum. Patrons having this problem usually have a very oily skin condition. Minor cases can be handled by the cosmetician; otherwise a dermatologist should be recommended.

The electrologist can treat these bundelhaar if not too many are present, but treating a large number of them will be a needless expense to the patron, since they do not need to be removed with the electrologist's equipment. Lanugo comedomes constitute more of a skin than a hair problem.

TELOGEN HAIR THAT FAILS TO SHED

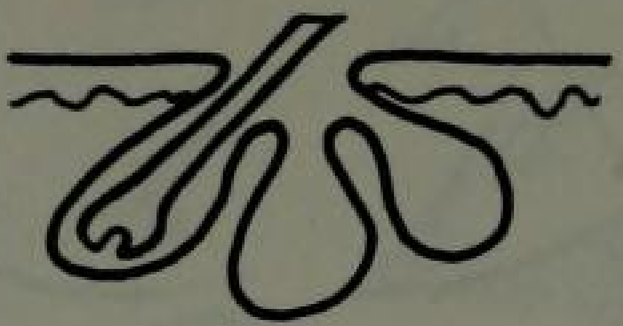


FIGURE 40. *Colorless stump—a telogen hair.*

A telogen hair that is large in diameter often reaches the surface and fails to shed. The shaved or clipped stump is usually colorless even though the other coarse hairs in the area are dark. These are the hairs that patrons can feel with their fingers but which the electrologist is barely able to see. Because they are no deeper than a lanugo hair many operators believe them to be coarse lanugo hair, which they are not. The reason for their lack of color is the fact that the club hair has lost contact with the source of pigment after separating from the papilla. Treat these as you would any other hair in telogen.

"CORKSCREWS"

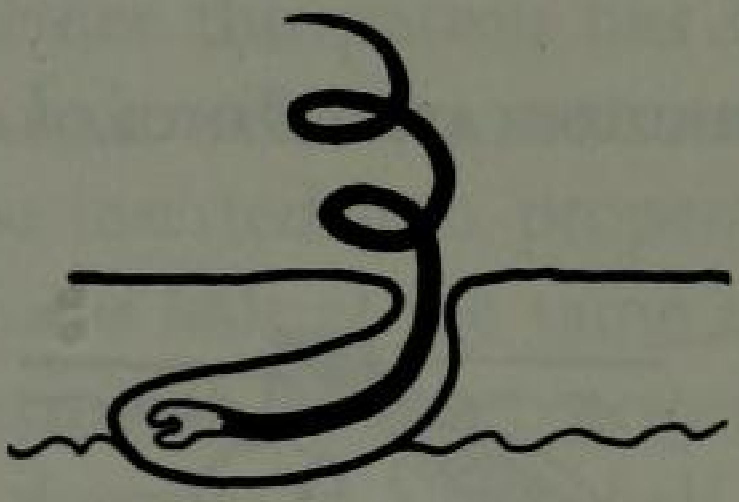


FIGURE 41. *"Corkscrew" a truly distorted follicle.*

After a certain area has been given a few treatments the spiral or corkscrew hair will occasionally appear. It is not unusual to see the bulb of the hair just beneath the horny layers of the epidermis. This is a truly distorted follicle and is no doubt produced by remnants of an almost, but not quite, destroyed pilosebaceous unit that has been disoriented.

These are best treated by piercing the epidermis and treating the bulb directly rather than attempting to follow the hair root. First, however, try just tweezing them—they usually give up.

"TOMBSTONES"

The remnant of a small anagen hair which was left unepilated in a treated follicle is called a "tombstone." It is a monument to a departed follicle. At times, the electrologist will destroy a follicle from which a telogen hair protrudes without realizing that a new hair was forming

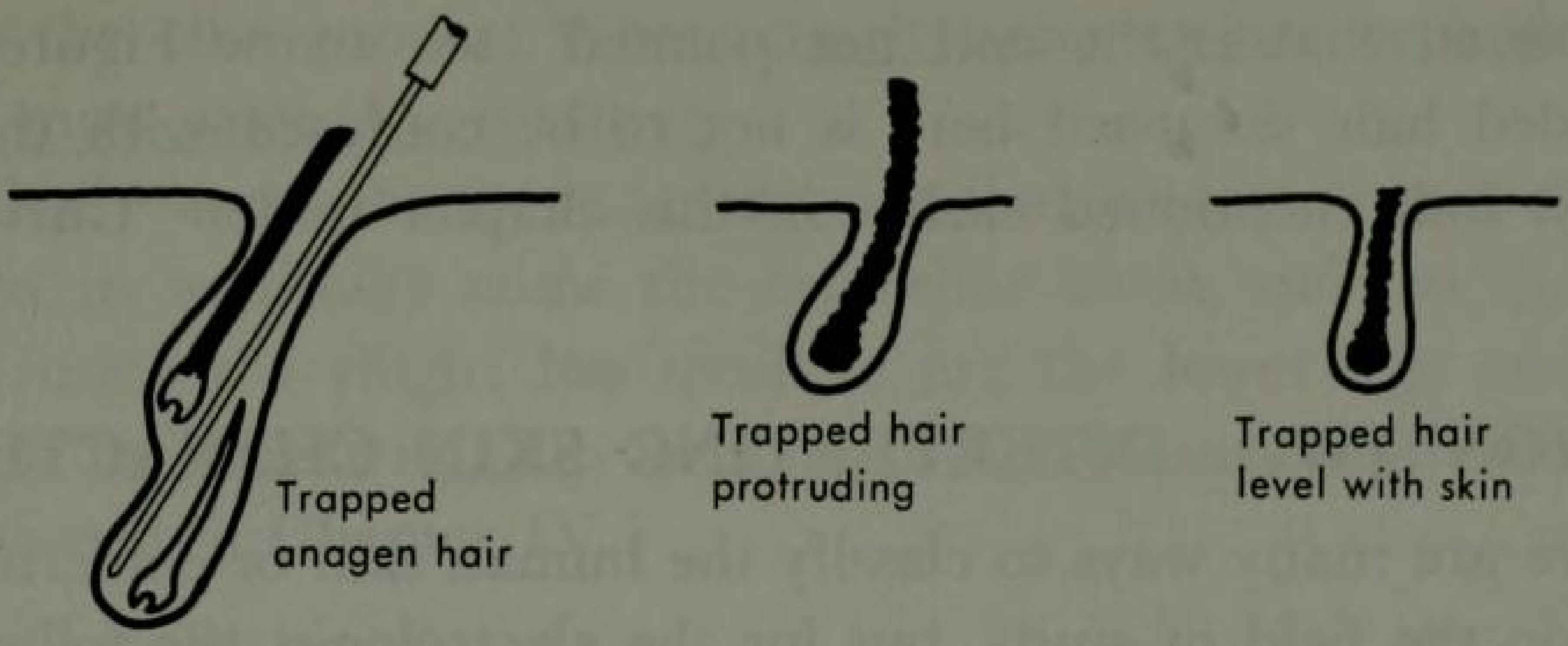


FIGURE 42. *"Tombstone"*

underneath. The tombstone is the result of treating the newly-formed anagen hair. The telogen hair was lifted from the follicle but the anagen hair underneath the surface was left to become a "foreign body" which has worked its way to the surface of the skin.

Tombstones appear dull and rumpled but thicker and darker than normal hair. They are brittle and break off in the tweezers. There is no need to treat tombstones. Thorough skin cleansing or tweezing will remove them.

EMBEDDED HAIR

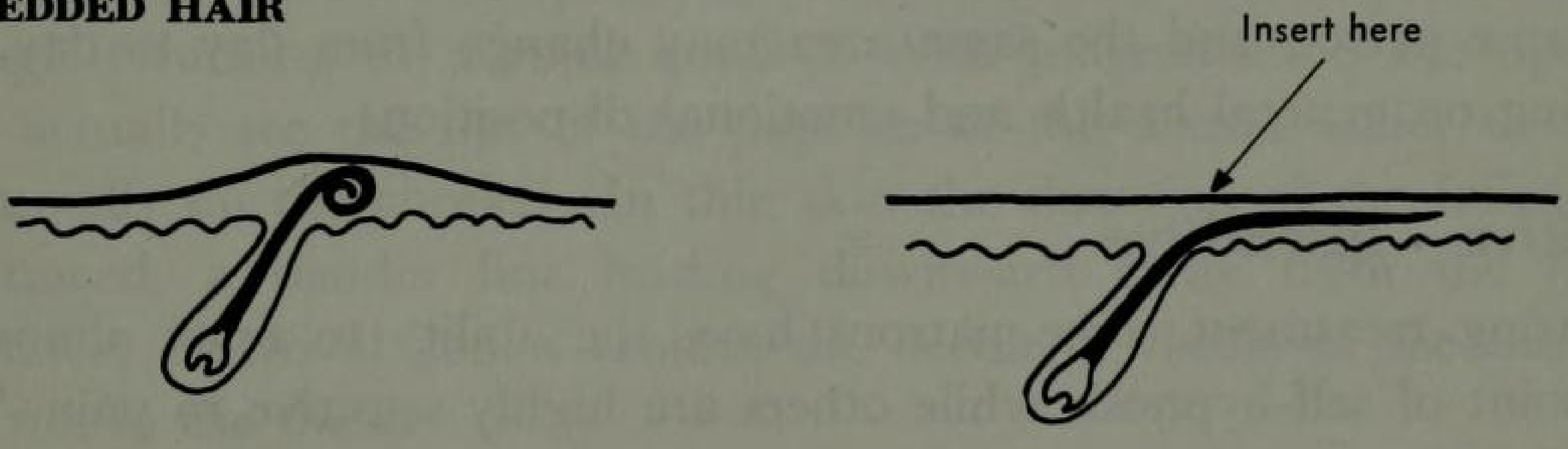


FIGURE 43. *Embedded hair.*

Hair that fails to emerge from the epidermis can be the result of several situations. It can result from an overtreatment of the surface which caused the skin to heal over the follicle opening or it can be the natural result of tight fitting foundation garments or belts. It is quite common on back of the thighs or buttocks of patrons who sit for long hours.

On some skins little bumps form which, when scratched away, reveal a coiled up hair. No infection is present but some redness may be evident.

Do not waste time on embedded hairs on the body. Encourage the patron to take tub baths and to apply body oil, lotions or creams to the area. These soften the skin, allowing the entrapped hair to break out.

An occasional embedded hair on the face can be removed by inserting through the epidermis at the end of the hair which appears to lead to the root, that is the end not pointed (see arrow Figure 43). The embedded hair discussed here is not to be confused with the *infected*, ingrown hair mentioned earlier in this chapter under "Curved Follicle Growths."

SECTION TWO: INTERPRETING SKIN CHARACTERISTICS

There are many ways to classify the human skin or epidermis depending upon the field of study, but for the electrologist the following chart provides a useful key to five characteristics of skin that affect her work.

Table Of Skin Characteristics

1	2	3	4	5
Sensitive	Soft	Thin	Moist	Oily
Average	Average	Average	Average	Average
Insensitive	Firm	Thick	Unmoist	Not Oily

The patron's skin reaction during treatment and in the following hours and days are determined by her own unique skin characteristics. There are not only differences between people but also differences on the same person from one area of the body to another. Furthermore the same person and the same area may change from day to day, depending on general health and emotional disposition.

Sensitive — Insensitive

During treatment some patrons have the ability to relax almost to the point of self-hypnosis while others are highly sensitive to pain. This variation in people is referred to as the pain tolerance level or the "threshold of pain" level. A person with a high threshold of pain is the "ideal" patron because she can tolerate large amounts of electrical action before experiencing discomfort. As a rule older patrons are less sensitive than young patrons.

A person with an average threshold of pain will have varying degrees of sensitivity from one area to another. Some will have an insensitive facial area but a very low threshold of pain on the leg area. This sensitivity factor affects our *technic speed*, that is, the rate of removal and percentage of follicles properly treated. On a highly sensitive area the skin could stand more treatment than the nervous system will allow, whereas on an insensitive area the skin might be overtreated without any nerve response at all.

The most sensitive area of the face and head are the center line areas such as the center of the lip, under the nose and the center of the forehead, followed by side lip, eyebrows, sideface, under chin, and least sensitive is the chin proper. Where much tweezing has been done the area is, in most cases, *less* sensitive.

Of the body areas the most sensitive is that region surrounding the nipple, next in sensitivity come the centerline areas, such as the spine, chest and inside the thigh; less sensitive are the lower legs and arms. (The reason for sensitivity, e.g. location of nerves and depth of follicle, will be discussed in Chapter IV.)

Soft — Firm

The softness factor does not usually affect our technic speed or machine setting but it does affect our ease of inserting the needle electrode into the hair follicle. Soft and loose skin are both opposed to firm in this classification. The chin and forehead are examples of firm areas, the underchin and front neck region being soft, loose areas.

Thin — Thick

The epidermal thickness is a factor that affects the electrologist in several ways. A thin epidermis appears red quickly because the epidermis is almost transparent and the blood can be seen through it. People that blush readily have a thin epidermis. They redden quickly from treatment, though returning to normal quickly. With magnification the operator can actually see the tips of the papillae of the derma under thin skin (especially on the cheeks). In thin skin the direction of the follicle can be traced, a slender line leading downward away from the follicle entrance. Electrical action around the needle is visible in the thin skin but not in the thick.

In most cases a thick skin on the treatment area requires a deeper than normal insertion of the needle. When treating the back of the neck, for example, the electrologist will note that a deeper insertion is required because of the very thick epidermis in that region.

The epidermis on the throat is obviously much thinner than that of the chin region even though the root and diameter of the hair may be the same. One can easily feel a difference in epidermal thickness by pinching first the front of the knee, and then the back of the knee.

Moist — Unmoist

To the electrologist moisture content is the most important skin characteristic. Since the only electrical currents known to destroy hair permanently rely on skin moisture for their function, how well they perform is directly related to skin moisture in contact with the needle.

A moist skin is one containing water or moisture. We have mentioned earlier that the epidermis is composed of stratified squamous epithelium.

The moisture of the skin is located within those cells which are least flattened, with moisture content decreasing in proportion to the flatness of the cell. The flattest cells occur at the surface, which means that moisture content increases with depth. The moisture content of any particular skin area is determined by the number of moisture laden cells. Older people have a dry skin because the majority of epidermal cells are flattened and waterless. The term "unmoist" is used to define a skin not moist with water; the term does not designate a lack of oil, which is another characteristic entirely.

The best way to become familiar with the appearance of moist skin is to observe the skin of an infant or a young child under magnification. Their skins are moist, unaccompanied by oiliness. In adults the axillia or armpit is very moist with no oiliness present. So also is the skin covering the throat. At the other extreme are areas that are very dry, such as the lower legs, elbows and knees. All other areas of the body range in moisture content somewhere within these extremes.

Varying degrees of moisture are found on the facial area so that as the electrologist moves from one area to another, changes in technic speed and skin reaction will be noted. The corners of the mouth and the areas one inch below each corner are very moist while the front of the chin is less moist.

Differences in moisture content require special precautions and technics. Deep coarse hair in soft moist skin is the greatest challenge to the operator. Since the greater percentage of our work is of this type, various means of coping with the problem will be discussed in later chapters.

Oily—Not Oily

By "oiliness" is meant that visible, shiny, oiliness which is due to active sebaceous (oil) glands. The oil characteristic has little relevance to the electrologist except for the fact that a layer of oil on the skin does prevent the escape of moisture, thereby allowing the moisture content to increase, which *is* important to us. Thus a naturally oily skin may be evidence of moisture. However, sometimes a patron will apply oil or cream to her skin to keep it from drying so that it appears shiny, but it is not naturally oily. The presence of artificially applied oil does not necessarily denote a moist skin, since a coat of oil must be maintained constantly for a period of days before moisture is restored to the skin.

Most naturally oily skins are moist unless alcohols, astringents and drying acne prescriptions are being used to combat the oily condition. When you observe an oily skin be aware that a moist skin *may* also be present.

There are some groups of people such as the Armenians and Syrians who have an oily type of skin characterized by what can best be described as a very low "melting point." Thermal currents act very severely on these types and caution should be used in their treatment. This will be discussed more fully in Chapter IX.

Summary

The outward appearance of hair and skin are the only guides the electrologist has for treating follicles properly. Without being able to recognize the appearance of a hair in later anagen, for instance, you will never know the insertion depth needed to eliminate the follicles in a given area. Again, if you cannot distinguish an oily skin from a moist one, you will not know the correct machine settings. These hair and skin characteristics will vary from area to area and from time to time requiring that the electrologist continually make new interpretations. Through practice the ability to make these interpretations eventually becomes part of the "sixth sense" which every good operator possesses.

Chapter IV

Neurology and Angiology

Neurology is the study of nerves, and *Angiology* is the study of the vascular system. These are such extremely complex subjects that a textbook of this type can offer only a general and elementary outline of them, one that is geared to the needs of the electrologist and the requirements of state board examinations. This chapter is not, therefore, a comprehensive treatment of the nature of the nervous system and the vascular system. To bring out the practical relevance of these fields to our own work, however, each section will make specific applications of general theory to problems of electrology.

SECTION ONE: NEUROLOGY

The nervous system is an intricate network of interconnected nerve cells called *neurons* which (a) help to maintain the chemical balance of the body, (b) provide the brain with information about the condition of the body and about the outside world, and (c) initiate and control any of the body's muscular activities. There are two major divisions of the nervous system, the *cerebro-spinal* and the *autonomic* system.

The **cerebro-spinal system**, or **central nervous system**, is a complicated "communications" network whereby conscious messages are received from and sent to various parts of the body. It controls voluntary activity and is comprised of the following:

1. Those parts of the brain which control "mental" activities, including those which are conscious.
2. Those nerves which control the voluntary skeletal muscles.
3. The receptors of the body surface which provide the special senses such as seeing, hearing, smelling, feeling and tasting.

The *autonomic system* is comprised of three sub-systems: the sympathetic, the parasympathetic and the enteric. It regulates such involuntary internal bodily functions as circulation, breathing, digestion and glandular activities through control of the following:

1. Changes in frequency of beats and volume of the heart.
2. The expansion or contraction of blood vessels.
3. The depth and rhythm of the expansion of the lungs.
4. The rate of production of all visceral organs such as the spleen, the kidneys or the intestines.
5. The rate of secretion by internally-secreting glands.

All nerves originate either in the brain, the spinal cord or ganglia (nerve centers). The nerve endings occur in muscles of the body, in visceral organs, in the skin and surrounding *hair follicles.* Each nerve cell has the properties of *irritability* (responsiveness to stimulation) and *conductivity* (ability to carry impulses). Heat, massage, electricity or certain chemicals will stimulate a nerve to greater activity.

Structure Of The Neuron

The *neuron* is a very complex cell. The *cell body* consists of cytoplasm surrounding a nucleus. These are the life substances of every kind of cell. Scattered about the cytoplasm in the neuron is a special *nissl* substance which varies in quantity according to the fatigue of the cell; a loss of nissl substance results from fatigue, certain fevers, asphyxia, and injury to the axon. Nissl substance is presumed to represent a store of energy for conveying neural messages.

Extending from the cell body are two kinds of *processes,* as they are called:

1. **Dendrites** are short thick processes which branch from the cell body in a tree-like manner. The number of dendrites will vary from cell to cell.
2. **Axons** are extremely long, attaining in some instances half the length of the body. The longest nerve of the body is the sciatic nerve of the leg; the shortest is the trochlear nerve near the eye. Usually a neuron has only one axon. The end branches of the axon are especially numerous in the skin, branching into many tiny *fibrils* (thread-like filaments).

A neuron receives nerve impulses from a neighboring neuron cell and conveys them on to another neighbor, normally transmitting in one direction only. The general orientation of the connections of a series of neurons determines the function they serve. *Afferent* (sensory) nerves are oriented to carrying impulses to nerve centers; *efferent* (motor)

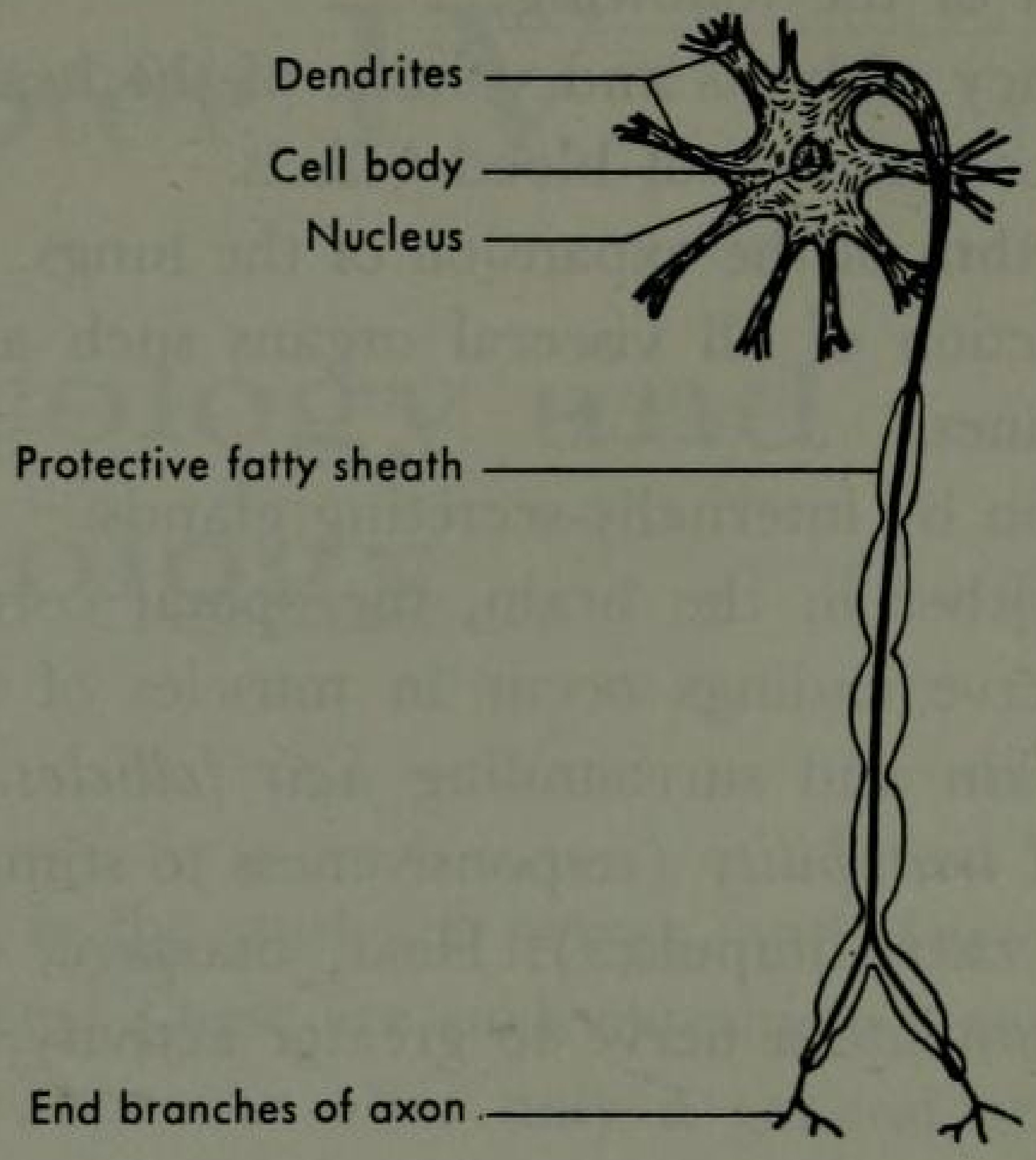


FIGURE 44. *Structure of the neuron.*

nerves carry impulses *from* nerve centers to the muscles. Afferent nerves tell the brain what is going on around the body; efferent nerves enable the brain to tell the body what to do about it.

Each neuron might be considered a separate tiny battery which, when excited by the discharge of the preceding cell, discharges some of its own electro-chemical energy in the direction of the next neuron. The "charge" is passed at the point where the terminals of the axon on one neuron come in contact with the dendrites or cell body of another. This point of juncture is called the *synapse.*

Nerve Endings Of The Skin

The skin is rich in sensory nerves, each area being serviced by a particular nerve of the cerebro-spinal system. Many fine fibrils extend upward from these nerves into the malpighian layer of the epidermis. These are the sensory receptors of the skin, which provide the senses of cold, heat, touch, pressure and pain. Nerve fibrils often overlap, like the branches of trees which have been planted too close to one another. This fact accounts for certain extremely sensitive points on the body. Irritation at a point where nerve endings overlap produces a message to the brain of "double" intensity, since two nerves rather than one are reporting the same "feeling." The centerline areas of the face, chest and back, as mentioned in Chapter III, are highly sensitive because of this overlapping of nerve endings.

Other branches of the nerves supply hair follicles with nerve endings. Unorganized, basket-like meshes of nerves encircle and penetrate the connective tissue sheath just below the level of the sebaceous glands. (See Figure 46.) This is the only part of the follicle that has a nerve connection. Because the position of this nerve plexus is fixed in position, the follicle may during catagen, slip right up past it, later growing right down through it again to the full depth of a follicle in anagen.

In many animals the association of nerves with the hair structure has made the hair a sensory organ with which to "feel" things which brush against it, but the function of nerve endings in the hair follicles of man is insignificant. The hair, as a true sensory receptor, is of little use to him. Some human follicles have no nerve complexes at all which may account for variations in pain response as the electrologist moves from follicle to follicle. In some animals the ability to "feel" with hairs is quite useful as in the case of the sensitive vibrissae (stiff hairs) growing around the muzzle and the face. The cat, it is said, uses the feel of his outstretched whiskers to determine whether a small opening into which he has poked his head will accomodate his entire body.

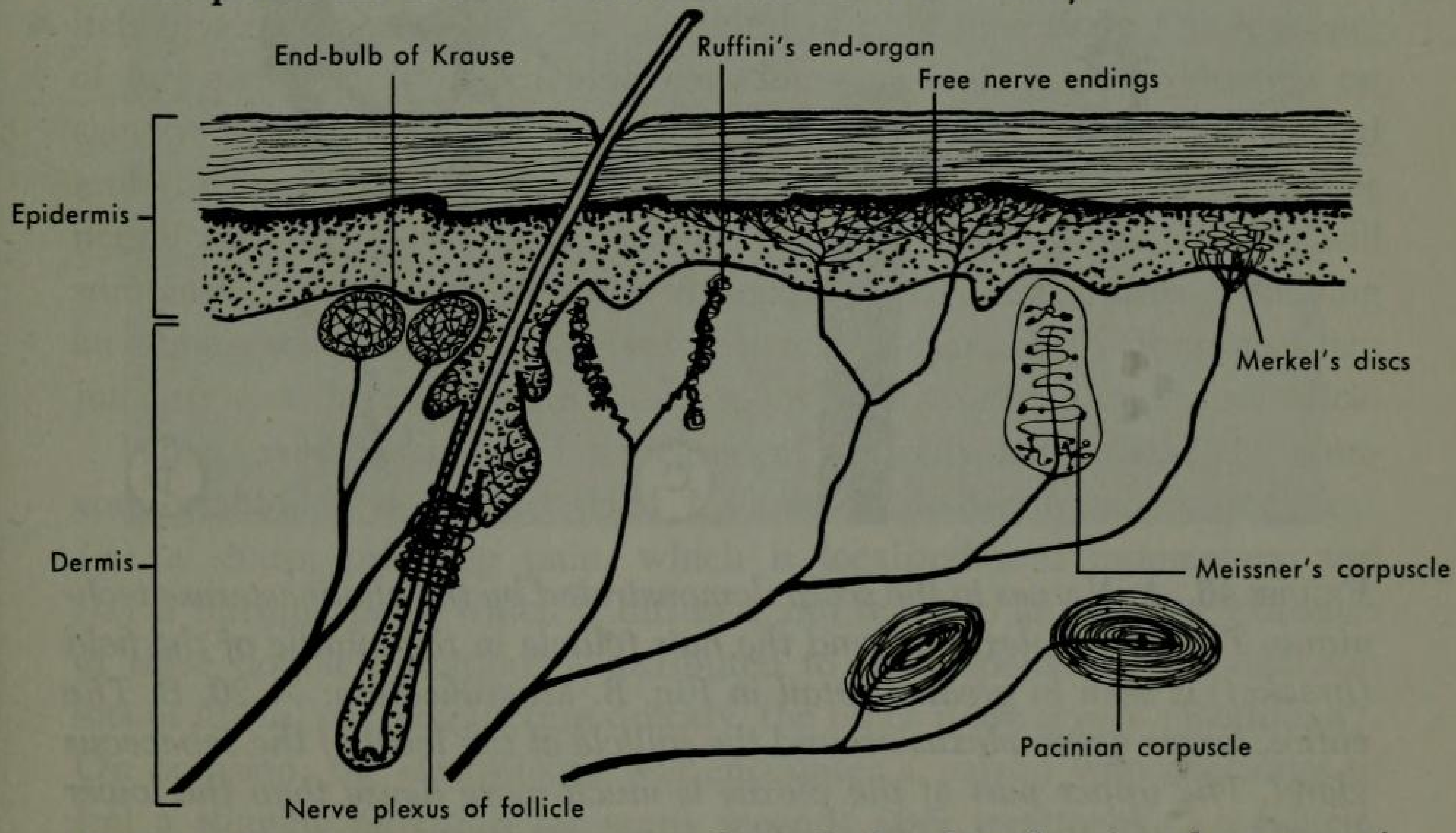


FIGURE 45. *Diagrammatic section through the skin showing the types of sense organs present. The sense organs respond to the following stimuli: cold — end-bulbs of Krause; warmth — Ruffini's end-organs; touch — Meissner's corpuscles and Merkel's discs; deep pressure — pacinian corpuscles, and pain — free nerve endings.*

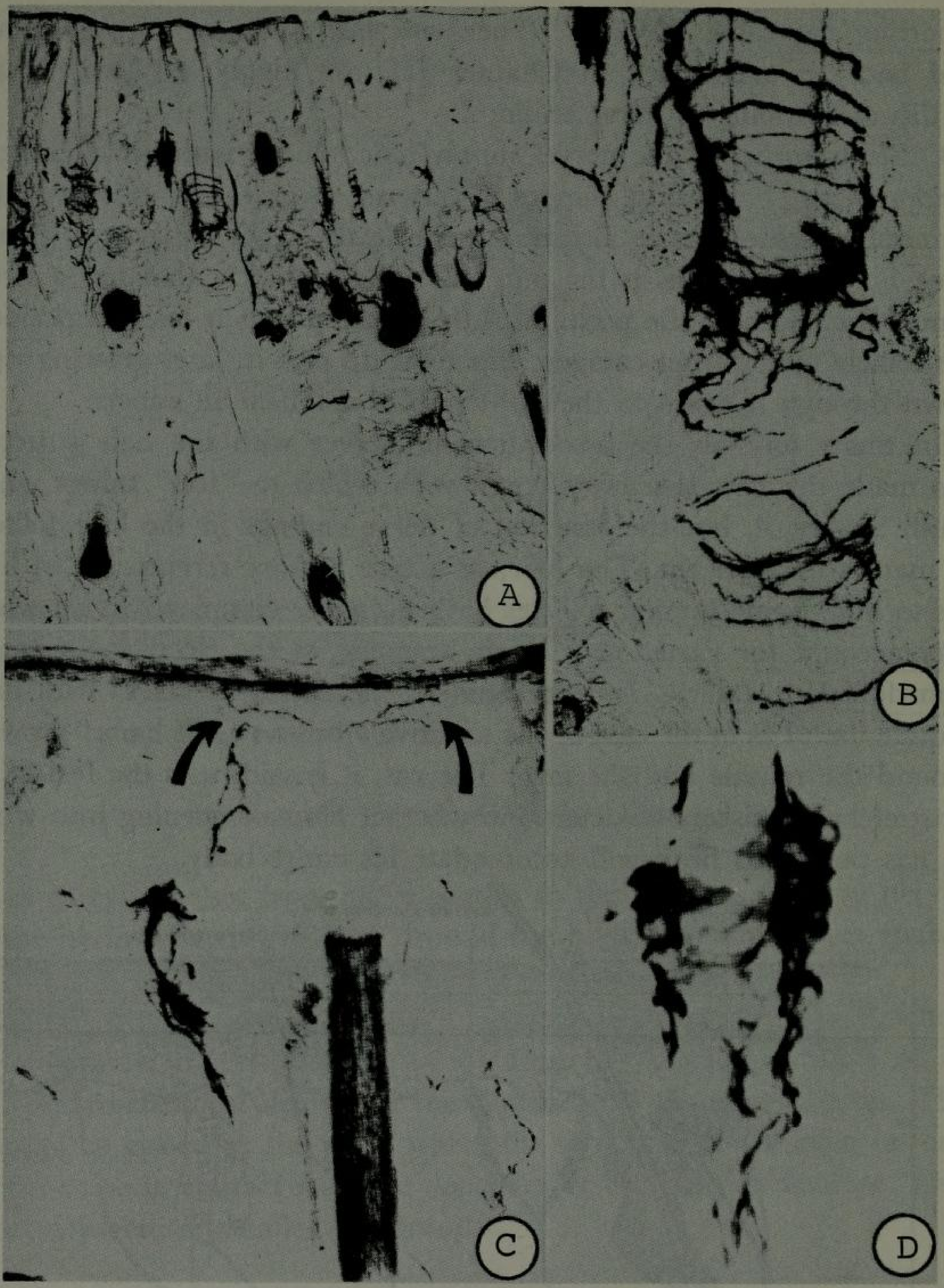


FIGURE 46. *A. Nerves in the scalp demonstrated by the cholinesterase technique. The nerve plexus around the hair follicle in the middle of the field (bracket) is seen in greater detail in Fig. B. Magnification: × 20. B. The entire, larger nerve plexus around the follicle at the level of the sebaceous gland. The upper part of the plexus is much more dense than the lower part. Magnification: × 90. C. The arrows indicate the upper, sparser nerve plexus which is very delicate and located just beneath the epidermis. Magnification: × 90. D. The partially collapsed nerve plexus around the base of a quiescent hair follicle. Magnification: × 160. (Reprinted from The Biology of Hair Growth by William Montagna and Richard A. Ellis, by permission of the Academic Press Inc., New York, New York.)*

Because the pain receptors of skin are located in the epidermis, and the nerve endings associated with the follicle do not extend into the lower portion of the follicle, the electrologist has good reason for placing her needle at maximum effective depth. *The further from the surface she works, the more current she can introduce before the nerves respond,* thus allowing a thorough action with minimum discomfort.

The Phenomenon Of Pain

Our principal reason for studying neurology is to gain a better understanding of the transmission of pain from receptor to brain. Next to the problem of permanent hair removal, pain is the electrologist's greatest concern. As we shall observe in later chapters the electrologist must use pain as a means of ascertaining that electrical intensity at the needle is adequate, and yet she must keep the pain level to a minimum, in order to give an effective but comfortable treatment. To understand how to minimize pain, we must understand the factors which bring it about.

In ordinary language, the term "pain" denotes a sensation intense enough to induce an emotional reaction accompanied by an attempt to withdraw from the stimulating agent. The intensity of "pain" associated with nerve endings in the skin is not necessarily as great as the term implies, however, for pain sensations vary widely in intensity. Even an itch or a "non-painful" prick is a kind of pain sensation. The intensity of any pain sensation reaching consciousness from a given location on the skin will be determined by the number of nerve fibrils being activated and the frequency and total number of impulses being sent along the neural communication links. A burning match held against the skin will stimulate a broad area of fibrils to maximum frequency, thus producing an unbearable sensation, whereas only a mild sensation will ensue when just a few of these fibrils are stirred to lazy life by, say, a minor pin prick.

When pain has reached a degree of intensity that marks it as uncomfortable, it is characterized by two easily-distinguished qualities: (a) a sharp, prickling pain, which is localized and momentary and (b) a burning pain, which is diffused and tends to linger. The existence of these double sensations is attributed to the response of two different sets of fibrils, one conducting quickly, the other more slowly (Rothman). On occasion, the electrologist will encounter a patron who continues to feel a stinging sensation for many seconds after treatment of a follicle, and this, no doubt, is due to an unusual delay and sustaining of the activity of the second of these sets of fibrils. Even the first of these sets does not respond instantaneously; if the electrologist is moving quickly from follicle to follicle, the patron may feel the sensation at each treatment point *after* the electrologist has already removed her needle.

The Pain Threshold

The concept of *pain threshold,* as we shall employ it here, refers to *that degree of pain sensation beyond which the intensity of pain becomes consciously uncomfortable or intolerable.* The goal of the electrologist is to work as closely to the pain threshold as possible, employing the maximum amount of current that the patron can comfortably take. The higher a patron's threshold level, the greater the intensity of current we can use, thereby shortening the length of time needed to treat any given follicle. Threshold levels will vary from area to area, from person to person and from day to day, as we mentioned in Chapter III.

Areas of the body will differ in threshold level from one another according to a number of factors, including thickness of the epidermis, the overlapping of nerve endings (as previously mentioned) and the number of individual pain receptors in the area. The following table, developed by Von Frey,* provides threshold data on specific pain spots.

The middle column indicates the number of pain receptors per cubic centimeter of skin surface, while the third column designates the relative pain threshold. By comparing the threshold figures for various areas of the body you will be able to anticipate the degree of sensitivity of your patron to treatment of these areas. As always, you will find exceptions.

Threshold Variability

Thresholds are not fixed physiological limits built into the system; they will change from time to time according to certain conditions. Among the various factors which effect changes in the threshold point, there are two which exert a major influence, the chemical composition of the synapses and the conscious focus of the patron. When dealt with properly, these can be used to the electrologist's advantage.

a) **The synapses.** The point of contact between two neurons is called, as we have said, the synapse. There is a thin "surface layer" or membrane which separates the protoplasm of the cells at this point, so that the electrochemical process or "impulse" which passes through each neuron must bridge across the synapse in order to stimulate an impulse in the succeeding neuron. Research has found that variations in transmission of impulses is largely due to changes in the synapses. Standing at the crossing like a miniature traffic officer, the synapse can speed traffic up, slow it down, or bring it to a complete halt, depending on what is influencing it. Powerful anesthetics, for example, can knock it out completely, blocking all messages of pain. Or repeated messages can "tire" the synapse, causing it to send messages more slowly.

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*Reported by Stephen Rothman, *Physiology and Biochemistry of the Skin* (Chicago and London, 1965), pp. 137-38.

DENSITY AND THRESHOLDS OF PAIN SPOTS IN DIFFERENT PARTS OF THE BODY

Skin Region	Number/CM²	Average Threshold (Gm.)
Scalp	144	1.35
Forehead	184	0.53
Dorsal aspect of nose	108	0.95
Tip of nose	44	1.00
Chin	196	0.55
Cheek	180	0.58
Lobe of ear	168	0.48
Anthelix of ear (rounded margin of lobe)	136	0.57
Outer edge of ear	76	0.78
Eyelid	172	0.18
Hyoid region (throat)	204	0.48
Jugular region (neck above collar bone)	228	0.26
Clavicular fossa (depression near collar bone)	212	0.28
Nape of neck (hairline)	176	0.65
Upper arm, medial aspect (body side)	208	0.29
Upper arm, lateral aspect (outer side)	200	0.46
Cubital fossa (depression opposite elbow)	224	0.27
Forearm, volar aspect (palm side)	203	0.32
Forearm, dorsal aspect (back side)	196	0.51
Dorsum of hand (back)	188	0.66
Knuckle of thumb	60	2-4.0
Inguinal region (groin)	220	0.38
Thigh, anterior aspect (front)	192	0.66
Thigh, posterior aspect (back)	176	0.60
Popliteal fossa (depression behind knee)	232	0.30
Leg, anterior aspect (front)	172	0.70
Leg, posterior aspect (back)	160	0.56
Dorsum of foot (top)	168	0.68
Sole of foot	48	2-4.0

Since frequency is a factor in the intensity of pain, the slower the synapse relays the message, the less one feels the pain. This effect can be observed when immersing in unbearably hot bath water. The water soon becomes tolerable, not because it has cooled very much, but because the synapses have tired of relaying the message of "hot water." *Continued stimulation* *of the pain receptors of the skin (at a fairly "moderate" level) tends to raise the pain threshold of the nerves which serve the stimulated area.*

The electrologist can take advantage of synapse fatigue by treating follicles in one small area at a time, rather than skipping around from area to area. You should limit treatment to an area the size of a quarter if possible, an area which would be serviced, in some areas, by a single nerve. Give the synapses a chance to fatigue as your treatments gradually spread out. Jumping two or three inches away brings the needle into an area that has not yet been dulled, causing the patron to experience a sudden increase in pain.

b) **Conscious focus.** Another factor determining the threshold of pain is the amount of attention one consciously gives to a sensation. Messages of pain from various parts of the body may deluge the "conscious center," but if the individual does not or can not pay attention to them, they will not cause discomfort. Inattention raises the level that pain intensity must reach before it can grab hold of your conscious focus and say to you, "Look, man, you're in pain." For instance, almost everyone has been involved in some kind of emergency situation where he or she has been scraped, cut or perhaps even seriously injured without being aware of it at the time. The pain sensations have been there all along, but attention has been wholly focused on the emergency, making it impossible for the pain to make itself known.

There are two methods which the electrologist has at her disposal for manipulating the patron's focus of attention; one is *distraction,* the other *suggestion.* Distraction is simply the purposeful diverting of the patron's attention from the sensation of pain to some other subject of interest. Many new patrons would put all of their conscious attention right at the bottom of the follicle if the electrologist did not engage their minds in pleasantries. The other method, suggestion, is the means of altering the patron's attitude toward her consciousness of pain. An individual will tolerate pain of a much higher level than normal if he or she associates it with good or pleasant things. Avoiding unpleasant ideas and stressing the positive side of the treatment enable the patron to take the treatment more easily. Hypnosis is an extreme and powerful form of suggestion, but the practice of this dangerous method is best left to those in the medical field who are qualified to use it.

Applying Patron Psychology

In view of the fact that both distraction and suggestion are needed to insure a comfortable treatment, the electrologist must exercise great care in the way she conducts the treatment. Often the success or failure of the electrologist hinges on her ability to deal with this problem.

In order for a patron to relax during a treatment, she must have faith and confidence in the electrologist. Apprehensiveness quickly lowers the pain threshold, whereas faith, as a positive form of suggestion, raises it. The operator's mannerisms should produce the impression that she is experienced and has knowledge of the profession. If the electrologist is rattled, nervous and jumpy the patron will also become so. If the electrologist is disorganized to the extent that she is not able to find the tweezers, or parts of the equipment or if she has to reposition the patron several times before beginning the treatment, she will have demoralized the patron. The patron sees such disorganization as a sign of incompetence.

Even the immediate surroundings of the treatment area can act as a form of suggestion. Needles and electric wires are unpleasant sights to most patrons, and their visual presence should be minimized as much as possible. Sharp tweezers, instruments, clanking container tops are all sights and sounds that should be kept at a minimum for the benefit of the patron. Conversation is sometimes a good distraction. Some electrologists talk incessantly to take the patron's mind off the treatment, and some patrons want to talk continuously to distract themselves. Other patrons, however, prefer complete silence. Often they can relax so completely that they fall asleep. The operator should be aware of these extremes and conduct herself accordingly.

Vocal anesthesia is the best means the electrologist can employ to raise the pain threshold of the patron. By implanting pleasant and comfortable thoughts in the patron's mind, the electrologist is able to use both distraction and suggestion effectively. This method is discussed in detail in Chapter XII.

Local Anesthesia

The electrologist is restricted by law from using any type of anesthetic other than those which can be applied to the surface of the skin. At present there is no really effective chemical available with or without medical prescription, which will eliminate pain when applied in this manner. It is possible that methods will be developed to force chemicals into the skin by electrical means (cataphoresis or anaphoresis), but this is something for the future. Benzocaine®, Xylocaine®, and other drugs of the "caine" family may work very well on the mucous membrane inside the mouth or other body cavities, but are ineffective on the epidermis. These drugs, when available without prescription, are usually in a 2% strength, but even at a prescribed higher strength anything applied to the epidermis is of little value.

Topical drugs injected into the skin are excellent but must be administered by doctors, dentists or other qualified persons, who in turn assume full responsibility for their use. Side effects, allergic reactions and other complications which may develop must be considered. Unless the electrologist is employed by or working for the doctor giving the injections, legal entanglements between the doctor's and the electrologist's insurance companies could become very complicated.

Keep in mind that some malpractice insurance policies become null and void if you apply or administer any drug of a prescription type to a patron. A typical policy may state that its protection does not apply to: "The rendering of any service or treatment or the use of any preparation, which service, treatment or preparation to the knowledge of the insured is prohibited under any federal, state or municipal law."

Depressing the Central Nervous System

Drugs which depress the central nervous system are of greater use in treatments than topical anesthetics. The use of common pain-relieving pills like aspirin and the many other advertised products for headache and body ache all have definite value because they relax the patron, thereby raising the pain threshold. Pills containing caffine should be avoided because the caffine has a "tensing" effect. (For the same reason, coffee should also be avoided prior to or during a treatment.)

IMPORTANT

You should never give, dispense or make available to the patron any type of pill or medicine — not even aspirin. Advise the patron of the value of pain relieving products and suggest that whatever she usually takes for pain relief be taken just before coming in for her electrology treatment.

If your patron contacts her doctor and tells him she is having electrology work done, he is usually most cooperative in providing prescription-type pain relievers and nerve depressants. The danger of using very effective pain relievers is that without some guide to the intensity of her treatments, the electrologist may overtreat the skin. A problem with partially effective relievers is that the threshold has merely been raised, not eliminated; the electrologist can easily exceed the new threshold if she is not careful.

Confusing the Nervous System

When two entirely different sets of signals are sent through a single set of nerves, the result is a confusion of sensations. For example, when a laboratory technician takes a blood sample from the ear lobe, he can eliminate the pricking sensation by pinching the lobe near the point where his needle enters the skin. The pinch, which activates a large number of nerve fibrils in the vicinity at a low frequency, tends to "drown out" the sensation from the few needle-activated fibrils pulsing at maximum frequency. The electrologist can utilize this effect in the same manner when making insertions. It is best not to hold with a steady pressure, but to slide, move or press with the fingers in the vicinity of the insertion just at the time the needle enters the skin.

The use of lotions that feel cold or give a tingling sensation in the treatment area also produces this effect. The image of the needle sting becomes blurred by competing sensations. Liniments and counter-irritants produce a heat sensation which often becomes confused with the heat effect of the electrologists' needle. Harmless gases released from spray cans feel very cold, diminishing for a few minutes the skin's nerve response. Products containing menthol, camphor, oil of wintergreen and the like that are used on sore muscles seem very effective on some cases. (Some patrons may be allergic to these substances.)

The blowing of air on the skin at the point of insertion is another way of producing a cooling effect as well as providing a mental distraction. It is very successful on a large percentage of patrons. Areas like the lip and underarm where sweat glands are abundant, benefit most, because the evaporation of the moisture produces a greater cooling effect. Dry areas like lower legs and arms seem to benefit least. A solution of camphor and alcohol applied occasionally during treatment sometimes helps. (1 oz. Gum Camphor block to 1 pint of 70% rubbing alcohol.)

SECTION TWO: ANGIOLOGY

The *vascular,* or *circulatory* system is comprised of the heart, the blood and blood vessels, and the lymph and lymphatic vessels. Its primary function is to distribute body fluids to all cells in order to maintain a constant state of bodily equilibrium (called hemeostasis).

Two distinct sub-systems participate in circulation:

1. The **blood-vascular** system consists of the heart, arteries, veins and capillaries, which all participate in the circulation of the blood.
2. The **lympathic system** consists of lymph glands and lymphatics which are involved in the circulation of lymph.

Circulation is constantly exchanging nutriments and oxygen for waste products. *Systemic* or *general* circulation performs the delivery of nutrition and oxygen to all of the cells of the body while *pulmonary* circulation involves a limited system that runs between the heart and lungs, and is concerned only with introducing fresh oxygen into the blood. One complete cycle of blood requires only 23 seconds. During this process the lymph glands constantly derive lymph from the blood, sifting out the impurities and returning it to the blood stream.

The heart is a complex visceral muscle which automatically pulsates at a normal beat of 70 to 75 times a minute. Within the heart an intricate exchange of blood occurs between the upper two chambers, the *atriums* (sometimes mistakenly referred to as "auricles"), and the lower two chambers, called *ventricles.* The blood coming into the heart from the general circulation is shunted over into the pulmonary system, and upon return from the oxygen-supplying lungs, re-enters another chamber of the heart to be re-introduced into general circulation.

The Importance of Good Circulation

Since the electrologist's intent is to destroy hair germinative cells and tissue it should be obvious that a complete rehealing of the epidermis becomes necessary after treatment. If this rehealing is unable to occur normally because of poor circulation, unsightly evidence remains after the work has been completed. To insure that this does not happen it is important that you see that the patron's blood supply is normal. People who have *diabetes* or various *circulatory disorders* may be slow in healing, in which case the work should be spaced out rather than concentrated in a small area. Make the first few weekly treatments one half hour or less. If the skin has returned completely to normal between treatments then no problems should arise. The average diabetic usually has, in our experience, no healing problem on the facial area. Work is not recommended, however, on the outer extremities, where circulation tends to be poor, e.g., lower legs or forearms and hands, unless the patron's doctor is first consulted.

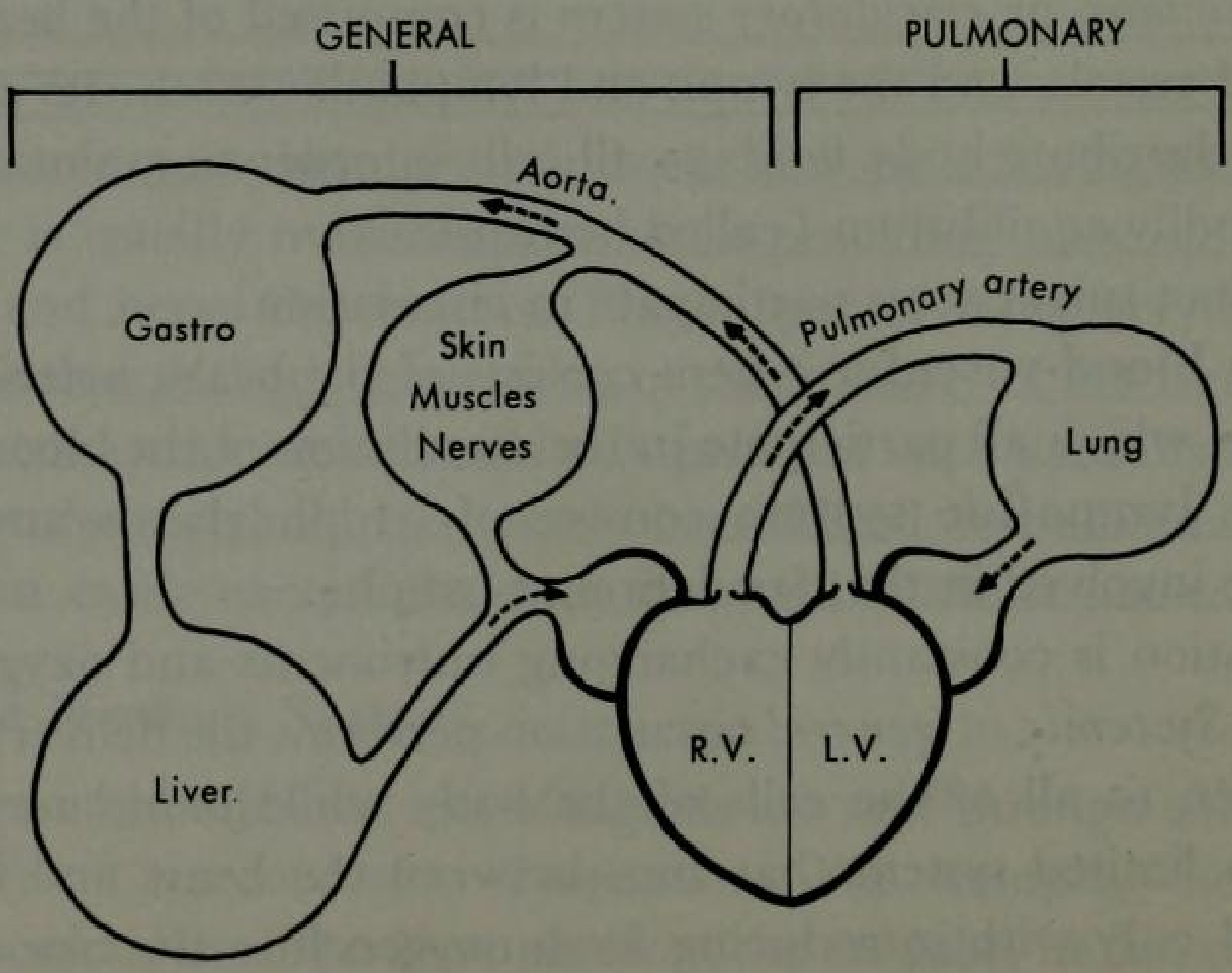

FIGURE 47. *General scheme of circulation of blood.*

Function and Structure of Blood

Blood flows outward from the heart through arteries, eventually enters capillaries, by which the cells are nourished, and returns with waste products through the veins. In its outward journey arterial blood is bright red, containing oxygen. The capillaries through which the blood then passes are extremely fine tubes, the walls of which are so thin that oxygen and nutriments can easily pass through them into adjacent cells, and waste products from the cells can enter the capillaries. After the blood has deposited its oxygen and nourishment, the *venous* or impure blood returning to the heart has become dark in color and contains carbon dioxide.

Blood consists of cells, or *corpuscles,* in an intercellular liquid, the plasma. It is derived from a milky white fluid, chyle, formed by the digestion of food. Blood makes up 1/16th of the weight of the body, and more than half of it is in the skin.

Plasma is derived from lymph, contains about 90% water, is yellowish and constitutes approximately ⅔ of the blood. The *red corpuscles* (erythrocytes) are given their red hue by a conjugated protein called *hemoglobin.* Hemoglobin has the capacity for chemically combining with oxygen, which it obtains in the lungs and gives up in the tissues, thereby performing a vital function in circulation. The red marrow of the bones manufactures red corpuscles. In a single cubic millimeter of blood there are five million red corpuscles.

White cells (leukocytes) are active protectors against infection and disease, destroying any foreign bodies which enter the blood stream. Some 5,000 to 9,000 of these would be found in a cubic millimeter of blood. Little is known of the life period of white cells. *Platelets* are also corpuscles, irregular in shape and lacking color. These help in clotting blood.

Platelets

Listed below are the seven most important functions of blood:

1. Supplying of nourishment.
2. Distribution of oxygen.
3. Removal of waste materials.
4. Distribution of heat.
5. The protection of the body from bacteria and infections.
6. Clot formation after injury.
7. Maintenance of constant body temperature.

Capillaries in the Skin

The dermis of the skin contains a large proportion of the body's blood vessels. Arteries enter the skin where they form a plexus (network) of capillary vessels which lies, as a layer, between the derma and the subcutis. From this major plexus, which services the entire tegument, extensions

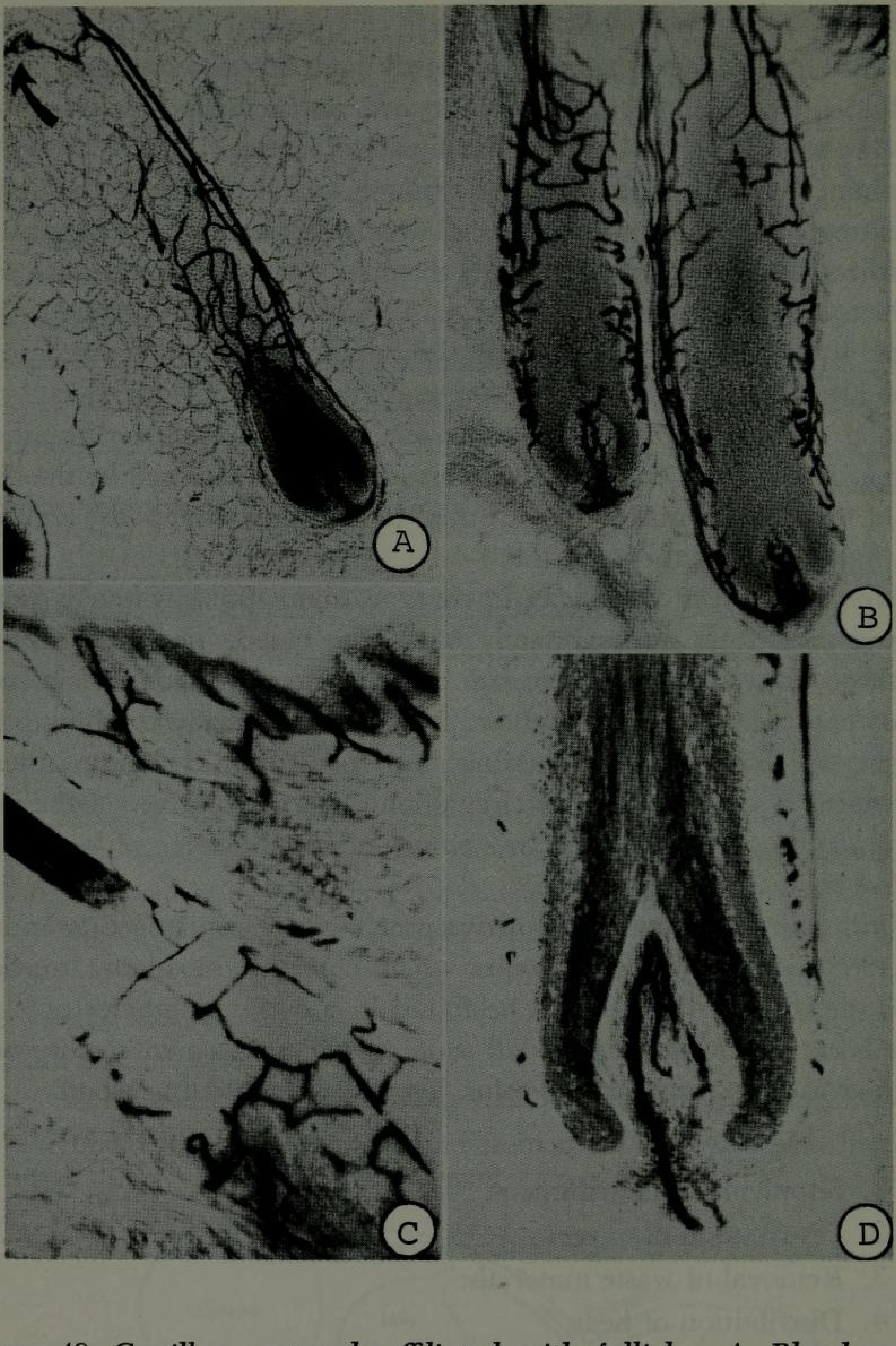

FIGURE 48. *Capillary network affiliated with follicles. A. Blood vessels around the lower part of an active hair follicle from the scalp. The parallel vessels originate from an artery of the hypodermal plexus which is shown in cross section (arrow). Magnification:* × *45. B. Two large active hair follicles from the scalp showing the rich capillary plexus around the keratogenous zone, as well as the parallel vessels and the capillary tufts in the dermal papillae. Magnification:* × *55. C. The capillary plexus around the upper end of a follicle in the scalp. Magnification:* × *90. D. A sagittal section through the bulb of an active follicle in the scalp showing the capillary tuft in the dermal papilla.*

branch off to service organs of the skin. Delicate plexuses extend upward from this layer-like one, and are especially well developed around the sweat ducts, sebaceous glands and upper portions of the hair follicle. Extending downward from the major plexus are other branches, some of which supply the bulbs of hair follicles through the cells of the papilla.

Effect of Treatment of the Capillary System

Occasionally the needle will pierce or overtreat one of the networks of capillaries affiliated with the follicle, producing a tiny drop of blood at the mouth of the pore. This has unfortunately been termed a "hemorrhage," but in order to avoid the exaggerated connotations of this term, we suggest the use of the term *"micro-hemorrhage."*

Two types of micro-hemorrhages are possible. Often when a needle induces destructive action in the follicle, the capillary walls are impaired to the extent that lymph or plasma will seep through and well up in the follicle, eventually hardening into a *honey colored* scab at the surface. This is undesirable on the face but is quite common during massive treatments of the body. The lymph crusts soon drop off leaving the skin as clear as before (one to four weeks).

When more severe damage is produced by overtreatment a large section of skin is disintegrated. A slow seepage of blood results, eventually producing a *reddish* scab. Such overtreatment ought to be avoided but if it occurs, the patron should be advised not to pick the scab. Under a protective crust the germinative layer of the epidermis will build up cells in the destroyed area of the skin. If the scab is removed, a large pit remains, requiring a number of months or perhaps years for the epidermis to regenerate cells that will level it. Chapter XII describes in greater detail the treatment of problems such as this.

The blood supply through the vascular system has the duty to rebuild all tissue and cells disturbed by the action of the electrologist's electrical currents. Too much treatment in too small an area taxes the blood supply beyond its ability to reheal the cells normally and, if the area becomes infected due to the entrance of pathogenic bacteria into the treated follicles, special home care must be instituted. Lotions, ointments, salves, (with the exception of antibiotics) do little more than prevent bacteria from invading the open follicles. They do, however, provide a cover under which the blood supply can perform its task. The body does the healing; we can help it by applying hot compresses which increase circulation in the area and by keeping the surface as free as possible from additional contaminating bacteria by the application of germicides, lotions, ointments and such.

Chapter V

Bacteriology and Disinfection

Chapter V is divided into two sections — (1) Bacteriology and (2) Disinfection. As in the first sections of Chapter IV, only a brief summary of the subject matter will be offered in the first section of this chapter. An elementary acquaintance with bacteriology will prepare you for state board examinations and increase your awareness of the need for sanitary precautions. The second section deals with information concerning sanitary practices and disinfectants, information which you must have in order to conduct your practice safely and in accordance with local and state laws.

SECTION ONE — BACTERIOLOGY

The term "bacteria" denotes, according to Webster, "a large, widely distributed group of typically one-celled micro-organisms, chiefly parasitic or saprophytic." (*Parasites* live at the expense of some other organism, their *host,* whereas *saprophytes* live on dead matter, causing it to decay.) The conveyance of infectious bacteria-ridden materials from one person to another will cause contagious diseases, skin infections and blood poisoning. While it is rare, this could occur when the electrologist re-uses implements that have been used on infected patrons without sanitizing or sterilizing them properly. Dirty hands and fingernails are also vehicles for dangerous bacteria.

Bacteria are vegetable — not animal — in nature, and are ordinarily so small that they cannot be viewed except with the aid of a microscope; hence they are described as *micro-organisms.* It would take fifteen hundred rod-shaped bacteria to span the head of a pin. They are visible as a mass only when thousands grow together to form a "colony." Bacteria are found almost everywhere but are especially numerous in dirt, dust, refuse and diseased tissue.

Of the hundreds of species of bacteria that exist, the majority are non-pathogenic (harmless). Many are, in fact, beneficial to man's existence. Bacteria are generally classified into two types according to their effect on other organisms.

I. **Non-Pathogenic micro-organisms** are those which are either harmless or beneficial. Because they decompose refuse and improve the fertility of soil they are invaluable to man. Several species are necessary for digestion, such as those which are used in the processing of yogurt. Penicillin is another example of a highly beneficial use of bacterial cultures. Penicillin represents an example of a parasite which is harmful not to man but to other micro-organisms. The majority of the non-pathogenic micro-organisms are saprophytes, which live on dead matter, not the living body.

II. **Pathogenic micro-organisms** constitute a minority in the micro-organic world, but they produce the lion's share of disease and pestilence both in plant and animal tissue. They are parasites, requiring living material for their growth. Pathogenic bacteria are classified into three main groups, according to their cell-shapes:

A) **Cocci** (singular, *coccus*) are round, and appear in groups or clusters. Among the cocci are found the following:

  1) *Staphylococci* (*staphylococcus*) grow in clusters. They are the pus-forming organisms present in abscesses, pustules and boils.
  2) *Streptococci* (*streptococcus*) occur in chains, and are the pus-forming organisms involved in blood-poisoning and the "strep" sore throat.
  3) *Diplococci* (*diplococcus*) grow in pairs, cause pneumonia.
  4) *Gonoccocci* (*gonococcus*) cause gonorrhea.
  5) *Meningococci* (*meningococcus*) cause meningitis.

B) **Baccilli** (*bacillus*) are short and rod-shaped in structure, varying greatly in diameter. These are the most common of all the bacteria, producing such diseases as tetanus (lockjaw), typhoid, influenza, tuberculosis and dyptheria. *Spores* (primitive reproductive bodies) are formed by many bacilli.

C) **Spirilla** (*spirillum*) are so named because of their spiral or cork-screw shape. Of chief importance among the various sub-groups are the *spirochaetol* organisms. The *spirochaeta* (also called *trepomena pallida*) is the causative agent in syphilis.

Bacterial Motility. When bacteria move, they propel themselves with the aid of fine hair-like projections, called *flagella* and *cilia,* which extend

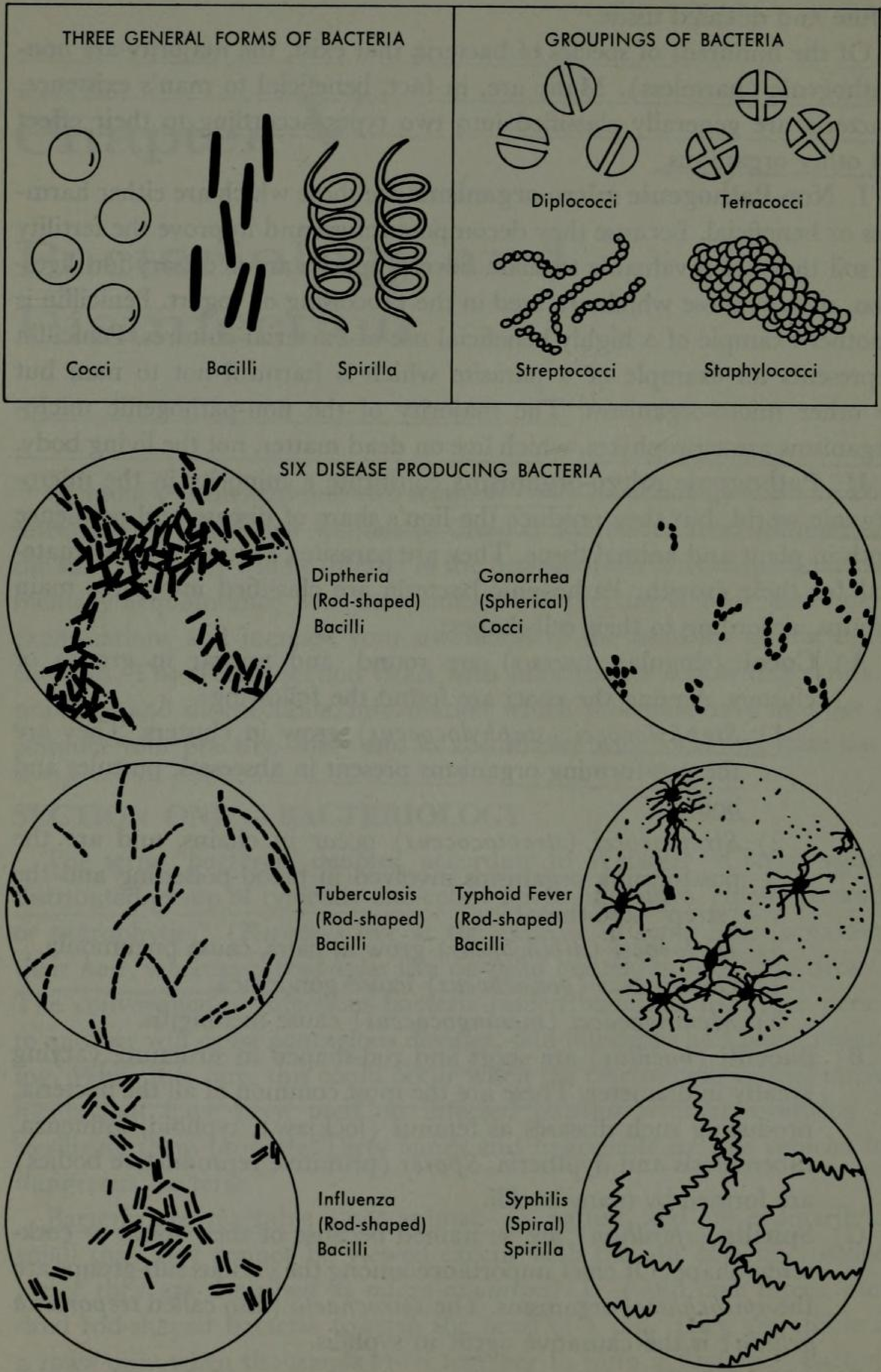

FIGURE 49. *Bacteria*

from the body wall and literally whip the organism through its fluid environment. Most motile bacteria are either bacilli or spirilla; cocci, in general, are non-motile.

Bacterial Growth and Reproduction

The single bacterial cell consists of a cell wall enclosing a life substance called *protoplasm.* A few bacteria are capable of photosynthesizing their own food with the aid of chlorophyll, as do larger green plants, but most of them must "digest" organic material found in the environment, later given off as waste products.

The ideal environment in which bacteria persist and multiply is any warm, damp, dark place in which there is sufficient organic material to feed on. Obviously, many parts of the human body qualify as a breeding place. Bacteria can convert human tissue into their own protoplasm. This enlarges the cell until it reaches a certain size, whereupon it divides transversely into two smaller cells (mitosis). Under ideal conditions, a single bacterium may yield as many as sixteen million decendants in the span of half a day.

Under certain environmental conditions, the protoplasm of certain kinds of bacteria, chiefly the bacilli, becomes condensed into a spherical or oval spore. A tough outer cover helps the bacteria to resist famine, heat or cold, dryness and disinfectants. The spore remains within the bacterial cell unit until conditions are right, upon which the cell wall disintegrates and the cell once again becomes active. Bacteria often enter the body in spore form, coming to life once they have found favorable surroundings.

Infections

Infections are produced by bacteria when human antibodies are incapable of limiting the spread of their growth. *Localized* infections are limited to a specific location, as in a boil, whereas a general infection is induced when bacteria are carried by the blood stream to all parts of the body (e.g., blood poisoning or syphilis). Pus, which consists of bacteria, body cells and blood cells, is usually a sign of infection. The body combats infection through the action of its white corpuscles and antibodies, which destroy bacteria, as well as through antitoxins, which counteract toxins produced by bacteria. Saliva and digestive juices also have an antiseptic effect, although to a lesser degree.

Infectious micro-organisms enter the body by mouth (food, air, water), by nose (air), through the eyes (dirt) and through breaks in wounds in the skin. They are transmitted by unclean hands, unclean instruments, sores and pus, mouth and nose discharges, and shared use of such things as cups, utensils and towels.

Non-Bacterial Causes of Infection

Filterable viruses cause disease such as infantile paralysis, smallpox, rabies and the common cold. These organisms are so small that they can pass through the pores of a porcelain filter.

Fungi are multi-cellular plant organisms. Having no chlorophyll with which to photosynthesize their own food, they are either parasitic or saprophytic. Molds, mildews and yeasts are non-pathogenic examples of this group. Ringworm and athlete's foot are typical diseases caused by this fungus.

Richettsia, although smaller than most microbes, are larger than the tiny virus. They can be transmitted by ticks, lice and other insects to man, as in the case of typhus fever or rocky mountain spotted fever.

Protozoa are one-celled animals, having a distinct nucleus, which is a capsule of specialized chemicals enclosed within the protoplasm. Among the parasitic varieties of protozoa is the amoeba, which can cause amoebic dysentery.

Animal parasites, which are multi-cellular insects, cause such contagious infections as *scabies,* which is due to the itch-mite, and *pediculosis,* which is cause by lice.

Immunity

When an immunity exists the body itself destroys bacteria by specialized antibodies. *Natural immunity* is partly inherited and partly developed through hygienic practices. *Acquired immunity* comes about either when specialized antibodies are formed to overcome a specific disease or when one has been injected with extracts from the blood of an animal which has developed the desired antibodies. A person may be immune to a disease and still be a disease carrier, transmitting such contagious diseases as typhoid fever and diptheria to others who are not immune.

SECTION TWO — DISINFECTION

Insofar as the electrologist is actually performing microscopic operations on living tissue, the danger of infection in electrology is always a possibility. The electrologist is bound both by law and by moral obligation to take all steps necessary to prevent the spread of disease, thereby protecting herself as well as the public.

State health boards vary from one another in their specific regulations concerning sterilization and sanitation, but all such regulations have a common goal — the elimination of any possibility of transmitting infection or disease as the result of contaminated instruments or careless practices. You should therefore acquaint yourself with the laws of your state concerning your legal obligations to maintain sterilization and sanitation standards. Often such regulations are identical for electrology and cosmetology, but we shall concern ourselves here with those aspects of sanitation and sterilization related specifically to the practice of electrology.

Disinfection is the general term for any process which disinfects or decontaminates an object or an area of the body. "Sterilization" and "sanitization" are terms which designate the effectiveness of any disinfecting process. *Sterilization* is that process whereby *all* bacteria are destroyed on a specified object. *Sanitation,* on the other hand, is a procedure whereby objects are rendered "sanitary" by means of a thorough cleansing, causing a temporary destruction of bacteria thereon. A sanitized instrument, in other words, has been decontaminated but is not necessarily as germ-free as a sterilized object. For the most part, the electrologist is merely required to sanitize her equipment, with the exception of the needle, which must be sterilized. Listed below is a wide variety of methods by which disinfection can be achieved.

Methods of Disinfection

A. **Physical agents** — methods which do not involve chemical action.

1) Baking (dry heat). This method is usually employed by hospitals.
2) Boiling (moist heat). Instruments are immersed in water at 212° Fahrenheit.
3) Steaming (moist heat). Hot steam is applied to objects in an air-tight chamber.
4) Irradiation (light rays). This involves the exposing of instruments or other objects to ultra-violet rays in an enclosed cabinet.

B. **Chemical agents** — the use of chemicals to destroy bacteria.

1) Fumigation. Fumigants in a sealed cabinet keep sterilized articles from contamination.
2) Liquid disinfectant. A disinfectant added to water for submersion of articles. This is the most common method of sterilization employed by electrologists.

Disinfectants and Antiseptics

The word *disinfectant* is the general term applied to any chemical agent which acts to disinfect by destroying bacteria or other micro-organisms.

A disinfectant is a stronger chemical agent than an *antiseptic,* which is safe enough to apply to the skin. The same chemical can be either a disinfectant, or an antiseptic, depending on its degree of dilution. For example, a strong alcohol solution (70%) would be called a "disinfectant," but a weaker alcohol solution (30%) is merely an "antiseptic." A disinfectant is powerful enough to destroy all microscopic organisms wherever it is applied. An antiseptic kills some but not all; its task is to slow down multiplication and thereby "contain" the enemy army.

Disinfectants are further specified according to their functions. A *germicide* is a strong disinfectant employed for killing germs although the term is often extended to include the destruction of bacteria as well. As is implied by their names, a *fungicide* destroys fungus and a *bactericide* eliminates bacteria. Although the distinctions among disinfectants, antiseptics and such subcategories as germicides, fungicides and bactericides are obvious, most cosmetology books somehow confuse them. The above definitions do not, therefore, necessarily coincide with those found in various cosmetology textbooks; they represent an attempt to clarify a traditionally confused issue.

Disinfectants and Antiseptics Commonly Used in Electrology

A) **Alcohol** (isopropyl or ethyl) – alcohol is available in various strengths as well as full strength, and can therefore be mixed with water in whatever proportions are desired. At 70% it is a germicide (disinfectant) and at 30-40% it is an antiseptic. Absolute (undiluted) alcohol is actually less effective than 70% alcohol because it tends to coagulate the outer membrane of bacterial cells forming an impenetrable barrier to further germicidal action.

Although all states permit the use of alcohol on the skin, its use produces fumes which are often obnoxious to the patron, and on occasion it tends to redden the skin. Alcohol does have some advantages, however. It cuts grease and dissolves cosmetics. And it will not stain or corrode.

B) **Formaldehyde.** This disinfectant is usually available as formalin which is a 37% to 40% solution of formaldehyde gas in water. By varying its strength, one can use formaldehyde in various ways.

1) At 40%, formaldehyde may be used in a *dry cabinet sterilizer.* A container of formaldehyde is placed in an airtight cabinet so that the fumes will protect previously sanitized instruments and objects against becoming contaminated.
2) At 5% strength, formaldehyde is a germicide. This is used for immersing instruments. It will not stain or corrode.

3) At 2% strength, formaldehyde is an antiseptic. It can be used for wiping off the skin.

The major disadvantage of formaldehyde is its pungent odor.

C) **Phenol** (carbolic acid). This chemical is popular with some electrologists even though it is poisonous and highly caustic at strengths above 5%. Like the first two chemicals, it has a pungent odor. At 5% it is a germicide, usable for instruments, and at 2% it is an antiseptic, acceptable for wiping the skin.

D) **Quaternary Ammonium Compounds** (referred to either as Q.A.C. or quats). These compounds are the most popular of all the disinfectants. They are manufactured under a variety of brand names (Roccal, Terramine, Barbicide, Zephiran, Bactine, some of which contain more than basic quats). Basic quats are odorless, colorless, tasteless, non-caustic, non-poisonous and non-corrosive. They are less expensive and more effective than other kinds of germicide, requiring that an object be immersed only *two minutes* (at the proper strength) as opposed to *twenty minutes* for other chemicals. Quats have a residual antiseptic effect for some three hours after application.

Strengths of these compounds are not stated in percentages but in terms of *p.p.m.,* which means parts per million. A 1,000 p.p.m. solution is commonly used for both instruments and skin.*

Most quats sold by cosmetology houses are basic quats. To the electrologist, pure Q.A.C. is insufficient; her task requires a wetting agent to reduce the surface tension of the oil of the skin and a detergent to cut the grease and clean the skin. An example of a more effective quat is Bactine† which contains 4% alcohol, a detergent and a wetting agent.

Always read the label and accompanying literature regarding contents. If a product lacks a rust inhibitor and if instruments need to be left in solution for long periods, ½% of sodium nitrate should be added to prevent rust.

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*1,000 p.p.m. is the required formula in states such as California; immersion time—two minutes. (1,000 p.p.m. can be re-expressed as one part in 1,000 or as .1%.) Most quats are sold in active strengths from 5 to 15%, but this is not always the case, especially with those solutions which contain ingredients other than the quaternary ammonium compound.

†According to Miles Laboratories, the manufacturers of Bactine, the quaternary ammonium compound present in Bactine, is methylbenzalkonium chloride in a 4% concentration. To obtain a Bactine solution containing 1,000 p.p.m. of methylbenzalkonium chloride put 4 ounces of *concentrated* Bactine in a gallon container and add bottled spring water. In some communities ordinary tap water is satisfactory unless it produces cloudiness. Distilled water is not recommended if the Bactine is used for cataphoresing.

DIRECTIONS FOR PREPARING DISINFECTANT SOLUTIONS

Name of product	Most commonly available base strength	Formula for making approximate dilutions	These mixtures make a solution of:
ALCOHOL (isopropyl or ethyl) (for instruments and skin)	70%	Use undiluted.	70%
FORMALIN SOLUTION (for dry sterilizer)	40%	Use undiluted.	40%
FORMALDEHYDE (Formalin Solution) (for instruments)	40%	Put 16 ounces in a gal. container, add water to make one gal.	5%
FORMALDEHYDE (Formalin Solution) (for skin)	40%	Put 6½ ounces in a gal. container, add water to make one gal.	2%
PHENOL (Carbolic acid for instruments)	88%	Put 6 ounces in a gal. container, add water to make one gal.	5%
PHENOL (for skin)	88%	Put 2½ ounces in a gal. container, add water to make one gal.	2%
QUATERNARY AMMONIUM COMPOUND (basic for instruments and skin)	when 10%	Use 1¼ oz. to 1 gal. water.	1,000 p.p.m.
	when 12.5%	Use 1 oz. to 1 gal. water.	1,000 p.p.m.
	when 15%	Use ¾ oz. to 1 gal. water.	1,000 p.p.m.

* The above table includes only those compounds which are of practical use to the electrologist. Other chemicals such as pine oil, orthophenylphenol, hexylresorcinal, dehydroabrietylamine acetate, cresol, sodium or calcium hypochlorite (chlorine), liquor cresolis compound, and bichloride of mercury are also permissible for use in such states as California. Consult the regulations of your own state concerning acceptable germicides and the required mixtures. The above mixture percentages conform to the requirements of the state of California at the time of this writing.

*See p.102 for further dilution information

Disinfection In The Practice Of Electrology

Whether or not an object needs to be sterilized or merely sanitized depends on the object's use in treatment. In the practice of electrology only the needle requires sterilization because it is the only piece of equipment which actually enters the protective epidermis. Sterilization of the needle and tweezer tips prevents contamination of one patron by another. Towels and linens need only be sanitized because there is less danger of communicating disease by their use.

THE NEEDLE

Sterilizing the needle requires two steps. Most state laws require that soap and water be used on any implement before it is sterilized in order to keep sterilizers as free as possible of pathogenic organisms and to keep the solution from becoming contaminated. Because of the needle's small size, however, it is impracticable to wash and wipe needles in soap and water. Instead, they should be wiped off with an approved disinfectant before being placed in the wet sterilizer if this was not done after the last time they were used. Sterilization itself should be done in a wet sterilizer, which is any covered receptacle containing an approved disinfectant solution or boiling water. (Ordinarily a covered dish or metal tray containing a quat solution of specified strength is employed.) No used needle should be stored without having been previously sterilized.

TOWELS AND LINENS

Items requiring sanitizing must be dealt with according to their nature. Towels and linens should be laundered in accordance with the rules and regulations of your state. Towels should be changed for each patron, but items such as pillow cases, which are always covered by a towel during treatment, require changing less frequently.

THE POSITIVE ELECTRODE

The positive electrode usually comes in the form of a pad or cellulose sponge which contains a heavy salt solution. This must be periodically rinsed. If it is washed with soap and water, every trace of soap must be rinsed from it before it can be used again as an electrode. Occasionally a metallic or chemical substance on the patron's hand will discolor the sponge with an electrolytic deposit. Therefore, every few days you should use chlorine bleach both to disinfect the sponge and to remove discoloration. A solution of one fourth cup of bleach to a pint of water removes even the blackest of stains in a few minutes. Do not allow the sponge to soak for more than five minutes; if it is not immediately rinsed in clear water at the end of this time it will disintegrate. After rinsing, it should be allowed to dry completely or be immersed in the salt solution again, otherwise it will mildew.

SKIN SURFACES

The electrologist must wash her hands in soap and water both before and after each treatment. The surface of the patron's skin where treatment will be applied must also be sanitized. A thorough cleansing with a disinfectant will remove most of the bacteria deposited on the surface by sweat and oil glands. Cleansing the surface can do no more than sanitize the skin because the upper portion of the follicles remain contaminated by pathogenic bacteria. As soon as the needle enters the follicle pore it becomes temporarily contaminated.

The actual danger of contaminating the lower follicle or sebaceous glands by pushing the needle down past the germ-laden area is negligible. Obviously if there is enough electrical action in the follicle to destroy human tissue there is also enough to kill any and all bacteria around the needle. The electrically activated needle is self-sterilizing. Occasionally a small infection of the pore will erupt twelve hours after epilation as a result of contamination, because the electrologist inserted into a follicle and *did not* apply current, but this is of a minor nature and will disappear. If disinfectant has been used properly and the patron exercises proper home care, these eruptions will occur infrequently. (This was the opinion offered by several experts, including William Montagna, in the investigation by the Federal Trade Commission in the matter of *Mahler's, Inc., et al.**

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*Federal Trade Commission, Volume 52, pp. 1217-1239.

APPENDIX A: IDENTIFYING Q.A.C.'s.

Because many disinfectant products do not specifically indicate that their contents include a quaternary ammonium compound, the following chemical descriptions are provided to help you identify a number of Q.A.C.'s. The list includes only the most common Q.A.C. formulae, but you will at least be able to recognize as a Q.A.C. solution any product which lists one of these among its contents. Those chemicals with an asterisk preceding them are the quats most frequently available from cosmetology supply houses.

QUATERNARY AMMONIUM COMPOUNDS

1. Alkyl benzyl benzyl dimethyl ammonium chloride.
*2. Alkyl dimethyl benzyl ammonium chloride.
3. Alkyl dimethyl-3, 4-dichlorobenzyl ammonium chloride.
4. Alkyl dimethyl benzyl ammonium bromide.
5. Alkyl dimethyl ethyl ammonium bromide.
6. Alkyl trimethyl ammonium bromide.
7. Alkyl benzyl trimethyl ammonium chloride.
8. Methyl dodecyl benzyl trimethyl ammonium chloride.
*9. Alkyl tolylmethyl trimethyl ammonium chloride.
*10. Para-diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride (monohydrate).
11. Para-diisobutyl cresoxy ethoxy ethyl dimethyl benzyl ammonium chloride (monohydrate).
12. Para-tertiaryoctyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride.
13. N-(acyl colamino formyl methyl)-pyridinium chloride.
14. Alkyl pyridinium bromide.
15. Alkyl pyridinium iodide.

APPENDIX B: TYPICAL RULES AND REGULATIONS (CALIFORNIA)

To acquaint you with the type of rules which your state may impose upon your practice, the following list has been excerpted from the current *Rules and Regulations* governing the sanitary conditions of cosmetological establishments in California. Only those rules of particular interest to electrologists are included.

A complete copy of Rules and Regulations may be obtained by contacting the proper agency in your state.

Posting Sanitary Rules.

Each school and each establishment shall post a copy of these sanitary rules in a place conspicuous to the public.

Water Supply.

An adequate and readily available supply of hot and cold running water shall be provided in the work booths or work rooms.

Equipment.

Each establishment shall have and maintain minimum equipment as follows: 1 closed receptacle of sufficient size to hold all soiled towels; 1 covered waste receptacle; 1 wet sterilizer; 1 airtight container (for sanitized instruments); 1 closed cabinet (for storage of all clean towels).

Personal Cleanliness.

(a) *Person and Wearing Apparel.* The person and the uniform or attire worn by an individual serving a patron shall at all times be neat and clean.

(b) *Washing Hands.* Every person training or working in a school or in an establishment shall thoroughly wash his or her hands before and after serving each patron.

Towels.

(a) *Used Towels to be Discarded.* After a towel has once been used, it shall be deposited in a closed receptacle, and shall not again be used until properly laundered and sanitized.

(b) *Method of Laundering.* Used towels shall be laundered either by regular commercial laundering or by a noncommercial laundering process which includes one of the following treatments:

(1) Immersion in water at 160°F. for not less than five minutes at some time during the washing or rinsing operation.

(2) Immersion of the clean and thoroughly rinsed towels in an aqueous solution containing 100 p.p.m. of available chlorine for not less than one minute.

(3) Immersion of the clean and thoroughly rinsed towels in an aqueous solution containing 200 p.p.m. of a quaternary ammonium compound approved by the State Department of Public Health for not less than five minutes.

(c) *Storage.* All clean towels are to be stored in a closed dust-free cabinet.

Sanitizing Instruments, Materials, and Supplies.

All instruments, materials, and supplies of whatsoever character used for direct contact upon a patron require the following treatments:

(a) *Cleansing.* Thorough mechanical cleansing of the instruments, materials and supplies with soap and water or other detergent so as to remove all foreign material which might harbor bacteria.

(b) *Disinfection.* Disinfection of all instruments, materials, and supplies following each use or accidental soiling by one of the following methods:

(1) Immersion in boiling water for at least two (2) minutes.

(2) Immersion for at least two (2) minutes in a solution containing not less than one thousand (1,000) parts per million of quaternary ammonium compound approved by the State Department of Public Health.

(3) By any other method bacteriologically effective, which hereafter may be approved in writing to the Board of Cosmetology by the State Department of Public Health.

(c) *Rinsing.* Rinsing in clean water.

(d) *Drying and Storing.* Drying and storing in a clean, closed, dust-free cabinet or container.

Creams, Lotions, Powder and other Cosmetics.

(a) *Closed Containers.* All creams, lotions, and other cosmetics used on patrons must be kept in clean closed containers.

(b) *Powder Shakers.* All powder used on patrons must be kept in a clean shaker.

(c) *Removal of Cream and other Cosmetics from Container.* Creams and other semi-solid substances must be removed from the container with a sanitized spatula or other article; the use of fingers for removing creams, etc., is prohibited.

(d) *Removal of Fluids from Container.* Lotions or fluids shall be poured into a sanitized glass or other container and shall be applied to the patron by means of cotton or other sanitized applicator. Any excess remaining after application shall neither be returned to the original container nor applied to another patron; but shall be discarded immediately.

(e) *Removal of Applied Cosmetics.* Creams, lotions, powder and other cosmetics shall be removed by means of cotton, gauze, pledgets, soft absorbent paper, or other sanitized material.

Chapter VI

Dermatology

Dermatology, the study of the skin, its diseases and treatment, is a subject of special practical interest to the electrologist. In our profession the presence of lesions or inflammation of the skin poses a critical question: when and when not to treat. State and local laws, enacted to protect both you and the public, specifically prohibit treatment of any area of the body exhibiting severe infection or a contagious skin disorder. Some skin conditions are a warning signal not to perform your services on a patron and others are not; only a solid foundation in basic dermatology will enable you to make the distinction.

Post treatment problems create a second and equally important reason for you to acquire a knowledge of dermatology. Because of the nature of your work, you will, on occasion, encounter skin reactions or infections which seem to be the result of treatment. To be sure, there is always some hazard involved in introducing a foreign object into the skin and destroying tissue with electrical action. However, in the great majority of cases a skin problem which emerges after treatment is not the result of the treatment itself but of something about the patron. Allergies or other peculiar features of the skin, for instance, are often to blame. Unless the electrologist is able to recognize these conditions, she is apt to receive—and accept—blame for all such problems. With a better understanding of these things you will be better equipped to help patrons find proper care for their dermatological problems, rather than lose their patronage through ignorance.

This chapter has been organized chiefly as a practical guide for the electrologist. The first section will deal with those disorders of the skin which are most apt to be encountered *prior* to treatment. The second section deals with problems which may arise *during* or *after* treatment.

Since many of the terms introduced in the first section are included in state board examinations, the first section has been set up in outline form. Both sections discuss skin disorders in terms of their relevance to electrology treatments. Because our discussion of this complex and extensive subject must necessarily be incomplete, it is suggested that the student acquire a standard dermatology book for a more complete reference source on the subject.*

SECTION ONE: PRE-TREATMENT DISORDERS

It is good practice, whenever you examine a new patron's hair problem for the first time, to take a good look at her skin as well. Usually it is not difficult to detect a skin disorder. Unless the problem involves some sort of skin allergy, the evidence of disease or injury most often appears right on the surface of the skin (*objective* symptoms). It is rare that only an itching or burning sensation will reveal skin problems (*subjective* symptoms). The type of lesions or blemishes your examination uncovers will indicate whether or not treatment is advisable at present or in the future.

To safeguard the health of both yourself and your patrons, you must not treat cases in which the lesions indicate severe infection or contagion. But there is a fine line between what is treatable and what is not. Acne, for instance, is a form of infection, but treatment of acned skin, unless the condition is extreme, is not at all dangerous to either the electrologist or the patron. In the final analysis, the manner in which the electrologist deals with a minor problem of infection and contagion will be determined by the laws of her particular state, and the conditions of her insurance policy.

The advice offered in the following pages (and also in Chapter XII) concerning the manner in which minor conditions can be treated is not intended to be an interpretation of any state law. *Check to be sure that these procedures are in accordance with your state law or your insurance policy before employing them.* In many cases it is advisable to have the express approval of a qualified specialist before working on cases involving local infection.

Lesions

A *lesion* is a structural or functional change in tissue caused by disease or injury. Because each stage of certain diseases and injuries is characterized by a particular type of lesion, one type replacing another, lesions have been classified into three types: primary, secondary and tertiary. A *primary* lesion is one which appears immediately upon or soon after the advent of disease or injury. *Secondary* lesions are those which follow, and are due to, a primary lesion. A scar, for example, sometimes replaces a severe pustule in this way. *Tertiary* lesions occur only with serious diseases, such as syphilis, which manifest three cutaneous stages. In most cases, the classification of any type of lesion as primary, secondary or tertiary is meaningful only with reference to the specific disease with which it happens to be associated. A skin ulcer, for instance, is a primary lesion when it is the first sign of venereal disease but it is a secondary lesion when it results from deep fungus infections or tuberculosis.

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*Every electrologist ought to have a complete dermatology text containing, if possible, color photographs of skin lesions. Several good books on the subject have been listed in the bibliography at the back of the book.

Except when lesions appear in isolated instances, they are usually symptomatic of a generalized disorder. Among the possible general causes of lesions are *congenital* diseases (inherited), *seasonal* diseases (such as prickly heat), *parasitic* diseases (e.g., lice, ringworm), *pathogenic* disease (bacterial action), *systemic* disease (malfunction of the endocrine glands), *venereal* disease (acquired through a warm, moist contact) and allergies.

The similarity of lesions from one disorder to another makes diagnosis extremely difficult. Pink or red inflammatory macules could, for example, reflect typhoid, secondary syphilis, typhus or certain types of allergic reaction. Furthermore, a disease like syphilis, which is known as the "great imitator," is capable of causing lesions of many different forms during its various stages. Doctors must frequently make extensive tests to discover the nature of skin disorders. Dermatology is therefore too complicated a field for the electrologist to make any but the simplest diagnosis. *The appearance of any lesion capable of being associated with a serious disorder is a danger sign*; the electrologist should refer the patron to a physician or specialist for diagnosis before beginning electrology treatments.

The following list is provided to enable the electrologist to recognize the general type of lesions which appear on the skin. Each type is further categorized according to the specific disorders of which the lesion may be a symptom. The list is thus intended to serve as a rough guide for deciding when to treat and when to refer the patron to a doctor. Simple, isolated pimples or pustules, for example, pose no problem so long as they are not treated themselves, but something like an extensive distribution of papules, unless readily recognizable as acne or some other relatively harmless condition, may indicate the presence of a serious disorder and should not be treated without a doctor's approval. The only exceptions to this rule would be those cases in which the patron is already aware of the cause of any suspicious-looking lesions she may possess. If it is not a disorder which involves severe infection or contagion you may proceed without further concern.

The following are the general classifications of lesions:

Macule. A distinctly discolored spot on the skin, neither raised nor sunken in relation to the surrounding level. Chief among the common macules are:

1. Pigment changes in the skin: *freckles*, flat pigmented *moles*, *loss of pigment* (leukoderma), *liver spots* (chloasma) and stains.
2. Pink to red inflammatory macules. These may be indicative of *typhoid*, *typhus, secondary syphilis* or *allergenic drug reactions.*
3. Blue macules in the pubic region. These indicate the presence of *crab lice* (phthirius pubis).

Papule. The smallest of three general categories of lesions characterized as raised, solid lesions lacking fluid. In order of size, the three lesions possessing these characteristics are (1) the papule, (2) the nodule (or tubercle) and (3) the tumor. The papule is pimple-sized and can be infected with pus, in which case it becomes a *pustule*. Common papular eruptions are:

1. *Pityriasis rosea,* a self-limited skin disease of the trunk. Eruptions sometimes are barely evident.
2. *Early mucocutaneous syphilis.* Papules tend to be juicy and easily molded, are most commonly found around mouth and anogenital region.
3. *Psoriasis,* a chronic inflammatory disease of the skin. Lesions are round, dry papules covered with coarse, silvery scales.
4. *Acne.*
5. *Drug eruptions.* These may occur in many forms.
6. *"Scratch" papules,* a local reaction to scratching, rubbing or digging in areas easily reached. Possible causes are an underlying skin disease, a habit or an underlying neurotic instability.
7. *Warts* (verruca).
8. *Seborrheic keratosis,* flat, brown, greasy feeling papules, having a warty texture. No danger of malignancy. (It is seldom that any keratosis has a hair growth.)
9. *Actinic keratosis,* hard, horny papules produced by exposure to sun and wind, sometimes called "sailor's skin." May become malignant.
10. *Senile keratosis,* hard, horny papules which develop with age, are subject to malignant degeneration; often called "old age spots."
11. *Molluscum contagiosum,* a chronic virus infection, characterized by pin-head-sized to pea-sized, waxlike papules of a yellowish white or pinkish color.

Wheal. A special type of papule which is ordinarily temporary, lasting a few minutes to several hours, but capable of recurring. These are itchy, swollen lesions often associated with hives, the bite of a mosquito or such skin disorders as urticaria or eczema.

Nodule (or Tubercle). The second largest of the three fluidless protuberances of the skin, ranging in size from a pea to a hickory nut. Unlike the superficial papule, nodules lie deeper in the skin or are entirely beneath it. Varying in color, nodules are warnings of possible medical significance, especially if more than one appears. They occur in the following instances:

1. *Nevi* (birthmarks), *lipomas* (a growth composed of fat cells) and *fibromas* (a benign tumor composed of whorls of white fibrous connective tissue). These usually occur single or in random locations. Presence of these types of nodules is not ordinarily indicative of any underlying disease.
2. *Syphilis*, either early infectious or late gummatous.
3. *Local reaction* in blood vessels to products of infection or allergenic drugs.

Tumor. The largest of the fluidless lesions and generally the deepest growing, varying in size, shape and color. Medically, there is no sharp distinction between nodules and tumors.

Vesicle and Bulla (Bleb). Raised lesions containing fluid derived from the serum of the blood. The watery fluid collects either within the epidermis or between the epidermis and the dermis, ranging in color from clear to pink. The bulla differs from the vesicle only in size, the larger bulla corresponding in size to the tubercle while the vesicle is more the size of a papule. The chief eruptions are:

1. *Contact dermatitis*, an inflammation resulting from the irritant effect of certain substances.
2. *Herpes simplex* (commonly called "fever blisters") and *zoster* (an acute inflammatory disease).
3. *Chemical*, *thermal*, *solar* or *friction injuries.*
4. Certain less common diseases.

Pustule. A raised, palpable lesion of the skin having an inflamed base and containing pus. The most common forms include:

1. *Acne* and *rosacea* (an acne-like condition occuring particularly on the nose, cheeks and sometimes the chin). These are often *pyogenic* (pus forming). *Furuncles* and *carbuncles* ("boils") entail a more extensive infection.

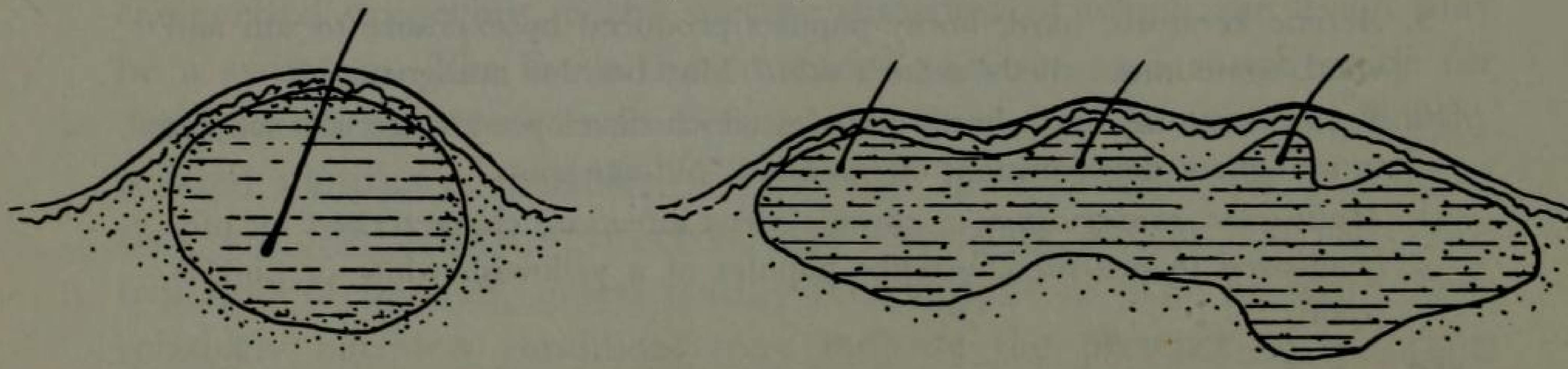

FIGURE 50. *Furuncle and carbuncle. Note depth of infection is beneath epidermis.*

2. *Impetigo*, a highly contagious, inflammatory disease.
3. Various *chronic eczematic eruptions.*
4. *Certain drug eruptions.*
5. *Contact dermatitis* caused in this instance by machine or mineral oils or tar collecting around hair pores.
6. *Acute fungus infections* (hands and feet).
7. *Smallpox*, *chickenpox*, *vaccination reaction* (cowpox) and *herpes.*

Crust. A scab-like accumulation of blood serum and pus at the surface of the skin, always a *secondary* lesion. The color of the crust affords a diagnosis of the condition of the epidermis. The three types of crusts are:

1. *Lymph crust*, a honey-colored scab indicative of serous oozing. This crust signals the absence of infection and is usually evidence that a skin disease or injury is healing. It forms a *natural protective dressing.*
2. *Pus crust*, a dirty gray or greenish-yellow crust indicative of infection. Pus or ulceration is present beneath this crust.
3. *Blood crust*, a reddish to black crust from dried blood, indicating that bleeding has occurred as a result of disease or scratching by the patron.

Scale. An accumulation of epidermal flakes, which may be dry or greasy, often a secondary lesion. Scales are found in the following forms:

1. Silvery, stratified scale of psoriasis.
2. Yellow, greasy scale of *seborrheic dermatitis* (a condition due to excessive secretion by the sebaceous glands).
3. Extensive exfoliating (shedding) scales wherein the horny layer of the skin continuously peels off due to eczema or dermatitis.
4. Fine scale of *pityriasis rosea* or *ringworm.*
5. Clinging scale of chronic *lupus erythematosus*, a chronic* disease of the skin which in its acute form can be fatal.

Excoriation. An ordinary sore or abrasion on the skin due to scratching or scraping. This is not necessarily indicative of any skin disease. It may be the result of hysteria or neurosis.

Fissure. A break or crack in the skin, penetrating to the derma. This is often the result of mechanical stress on diseased skin. It is also caused by harsh climatic conditions, as in the case of chapped hands or lips.

Ulcer. An open sore on the skin or mucous membrane (e.g., the lining of the mouth), characterized by the disintegration of the tissue and often the discharge of pus. Ulcers range from superficial erosions which heal without scarring to deep, chronic destructive lesions. Any chronic ulcer is a problem for consultation and hospital care. Among the more common ulcers are:

1. *Simple pyogenic ulcers* caused either by injury (e.g., ill-fitting shoes) or by certain predisposing diseases such as diabetes.

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*A *chronic* disease is one which is mild, but lasts for long periods, whereas an *acute* disease is one which manifests violent symptoms but is of shorter duration.

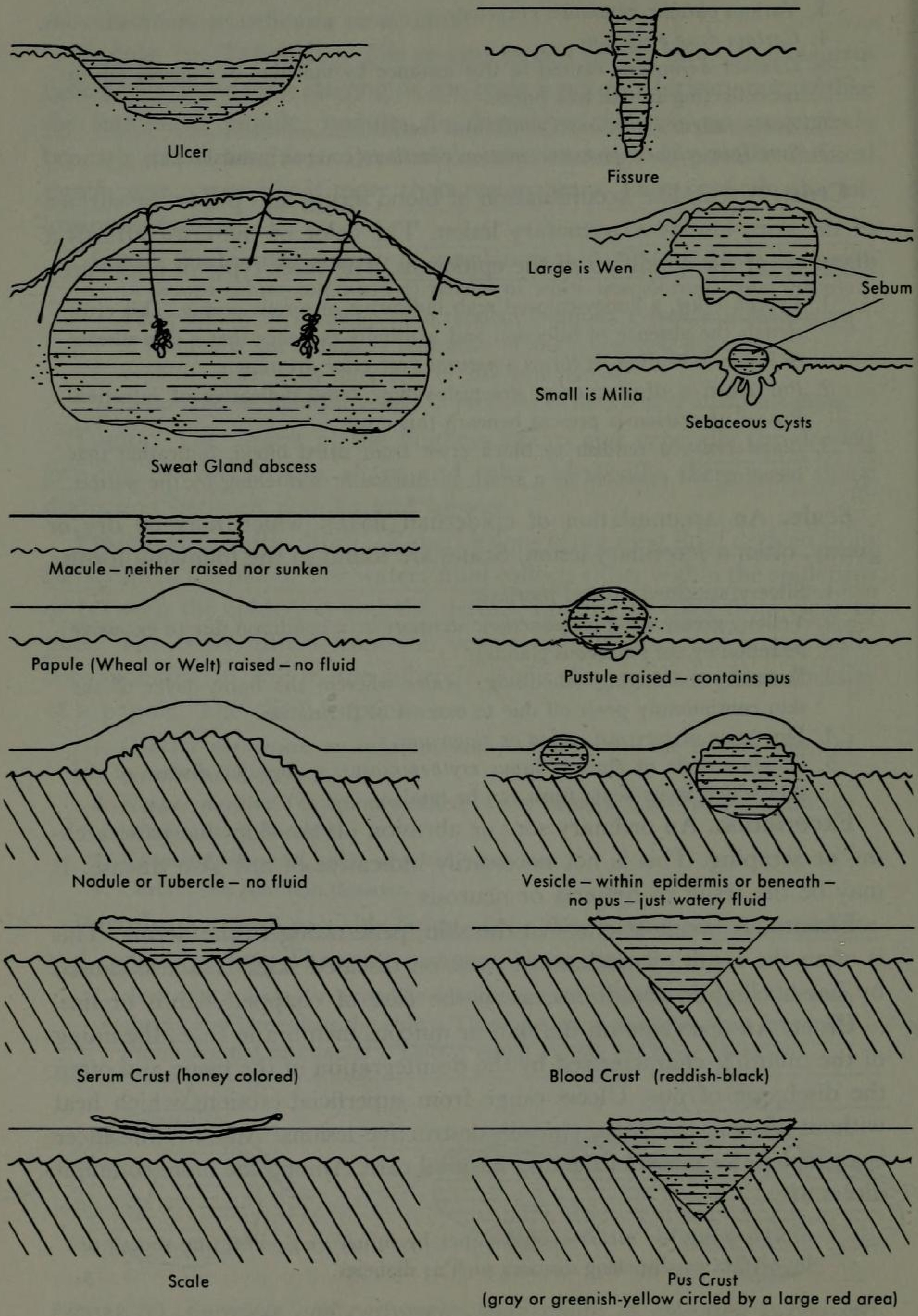
Ulcer
Fissure
Sweat Gland abscess
Large is Wen
Sebum
Small is Milia
Sebaceous Cysts
Macule – neither raised nor sunken
Papule (Wheal or Welt) raised – no fluid
Pustule raised – contains pus
Nodule or Tubercle – no fluid
Vesicle – within epidermis or beneath – no pus – just watery fluid
Serum Crust (honey colored)
Blood Crust (reddish-black)
Scale
Pus Crust
(gray or greenish-yellow circled by a large red area)

FIGURE 51. *Common lesions of the skin.*

2. *Nodular gumma*, a ringed arrangement of ulcers resulting from the breakdown of nodules.
3. *Granular ulcers* resulting from deep fungus infections or tuberculosis.
4. *Chancre* or *chancroid* of venereal disease. The chancre is usually the first sign of syphilis, most often—but not always—appearing at the mouth or the anogenital region.
5. *Malignancy*. Tendency of an ulcer to advance without healing may indicate a malignant growth.
6. *Ulcers* resulting from vascular disturbances.

Scar. A specialized tissue growth which forms during the healing of a wound or skin condition.

Skin Diseases Commonly Encountered

Because the electrologist is dealing with an average cross-section of the public, she rarely sees symptoms of the more serious diseases mentioned above. There are certain troublesome disorders, however, which appear fairly commonly. Listed below are the diseases of the skin most likely to be encountered in our work, along with advice on how to deal with them during treatment (when state laws or medical approval permits):

Herpes Simplex (**Fever Blister** or **Cold Sore**). An acute inflammatory infection of the skin, occurring as a swollen shiny vesicle, or a group of such vesicles, with an inflamed base. These usually appear around the mouth or on the nostrils, accompanying a digestive disorder, a cold or fever. To avoid spreading infection, restrict your work to the area of the face that is not affected, warning the patron that handling the cold sore will transmit the infection to the treated area. Cold sores should disappear within a week.

Impetigo. An acute, inflammatory and highly contagious disease of the skin occurring especially among children. It is due to the action of staphylococci. During the active stage, fresh lesions appear and spread daily, usually on the face, hands and legs. The lesions are characterized by the oozing of serum, which coagulates into honey-colored crusts that have a "stuck-on" appearance. Unsanitary habits are usually to blame.

Because of the great danger of transferring infection during or after treatment, it is not advisable to work on patrons with impetigo. If, with a doctor's approval, you do elect to treat a patron with impetigo, be sure not to treat any part of the body on which lesions appear.

Psoriasis. A chronic inflammatory skin disease characterized by reddish patches covered by silvery scales. Tiny bleeding points may be seen beneath the scales. Although the cause is unknown, emotional disposition has been found to be a factor. Because the disease is *not infectious*, the electrologist may work in the involved area, so long as the lesions themselves are not touched by the needle.

Urticaria (**Hives** or **Nettle Rash**). A skin condition usually characterized by intensely itching wheals or welts of a white, pinkish or reddish color, produced through extreme dilation of the skin capillaries. Urticaria is caused by a hypersensitivity of the skin and is usually of allergic origin. Although such a condition does not involve infection, it is not advisable for the electrologist to work in the affected area, which is greatly irritated. Ordinarily a person with this irritable condition would not be concerned with the immediate need for removing superfluous hair.

Eczema. An irritating vesicular skin eruption of *systemic* origin. It is often characterized by vesicles, scales, the exuding of lymph and subsequent crusts, along with itching or burning. This is a long-standing condition that dermatologists have found difficult to cure. It is not infectious and people suffering from it are not apt to ask the electrologist to remove hair from the area which is affected. Like urticaria, eczema is a highly discomforting disorder.

Dermatitis. An irritating vesicular eruption of *external* origin.* There is hardly any substance, animal, mineral or vegetable which cannot cause epidermal sensitivity, but some substances are more potent that others. Certain metals, for example, produce dermatitis in a high percentage of people who contact them over prolonged periods. Emotional disposition is a strong factor in this kind of sensitivity. Here again, the electrologist must be prudent in selecting a safe and insensitive area to treat. Dermatitis will be discussed further in section two of this chapter.

Parasitic Diseases of the Skin

Parasites, both animal and vegetable, often threaten the health of the skin. Because all of the common types of parasitic diseases are highly contagious, the electrologist should be familiar with them in order to avoid them. With the exception of localized athlete's foot (tinea pedis) the high danger of transmitting parasitic diseases makes the treatment of infected patrons too great a risk. Patrons should be referred to a physician and should be thoroughly cured before electrology treatments are undertaken. These are the more common varieties:

Tinea (**Ringworm**). A fungus (vegetable) infection of the skin characterized by a small reddened patch of blisters which spread outward and heal at the center without scaling. The disease is usually acquired

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*This useful distinction between internal and external causation in *eczema* and *dermatitis* has been introduced by Sneddon and Church, *Practical Dermatology* (London, 1964). See p. 12.

by coming in contact with infected scales or hairs, often through common use of showers, swimming pools and unsanitized articles such as combs or brushes. Family pets may also become infected and communicate the disease.

Tinea Barbae. Ringworm of the bearded areas and neck, also known as barber's itch.

Tinea Capitis. A contagious fungus infection of the scalp and hair, characterized by red papules at the follicle pore. The hair becomes brittle, tending to break off or fall from the enlarged follicle.

Tinea Pedis (Athlete's Foot). A fungus infection of the foot characterized in its early stage by scaling and sometime fissuring in the webs of the toes and the soles, sometimes followed by vesicles and swelling of the foot. Limitation of this contagious disease to the foot, which remains covered during treatment, makes it possible to treat patients on other parts of the body.

Scabies. A highly contagious, itching skin disease caused by infestation by the itch mite (acarus scabiei). Mites burrow into certain parts of the body, usually the hands and the wrists. The reaction of the skin is a general eruption of papules on the forearms, underarms, waist, inner thigh, buttocks and ankles, producing an itching sensation. The disease, if not treated, may eventually produce pustules, boils and ulcers.

Pediculosis Capitis. A contagious condition of the head and scalp caused by the infestation of head lice. Head lice lay their eggs (*nits*) near the base of the hair in the follicle. The nit, which surrounds the hair, then passes up out of the pore with the growing hair. The lice, once hatched, cause itching and secondary infection. They are transmitted from person to person through the use of infested brushes, combs, hats and other personal articles.

Pediculosis Corporis. Infestation of the skin of the body with the body louse. Intense itching from the bite of the louse may bring about

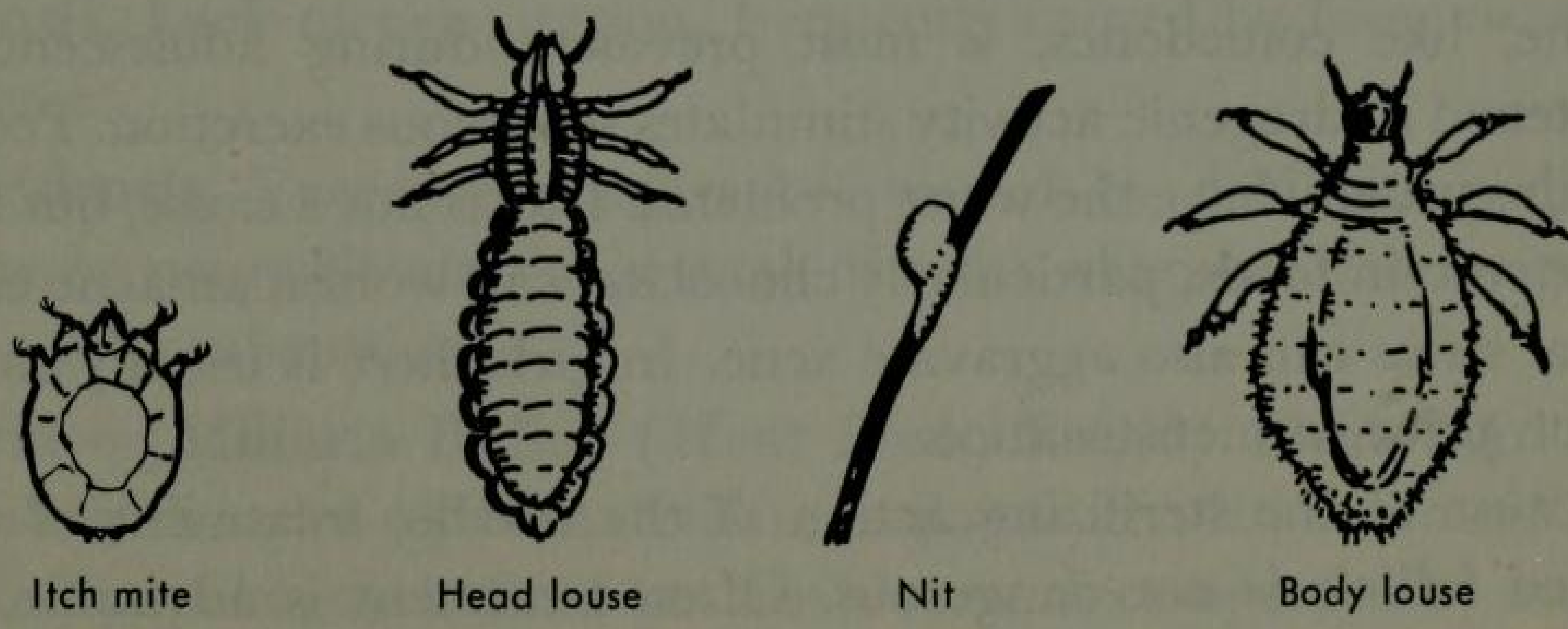

FIGURE 52. *Animal parasites of the skin.*

secondary lesions caused by scratching. Lice and nits are in the clothing; boiling or dry cleaning will eliminate them.

Diseases of the Sebaceous Glands

There are, to be sure, many skin conditions which pose no serious threat to treatment. Among these are the disorders of the sebaceous glands. By becoming acquainted with the symptoms of these disorders, you will be able to recognize treatable conditions when you see them. *Patrons with any of the following conditions may be worked upon:*

Comedones (Blackheads). A hardened plug of sebaceous material and dead cells retained in the pore of the sebaceous gland (rarely where a hair is growing). Its characteristic dark color is not caused by "dirt" but by chemical changes in the plug. Heightened sebaceous activity during adolescence causes formation of an excess of sebum which, through a hardening process (hyperkeratosis), often blocks the mouth of the follicle. The follicle or sebaceous gland may thereby become inflamed creating an acne condition. Squeezing out comedones should be discouraged because scarring may result.

Acne. A chronic inflammatory condition of the pilosebaceous unit appearing commonly on the face, back and chest. Acne may occur as merely inflamed (as a papule or nodule) or it may be pustular. In severe cases the lesions are accompanied by *cysts* (a sac with a distinct wall, containing fluid or other material). Acne is actually not a single disease; several varieties exist, although none is medically serious.

Acne begins with the blockade of the follicular canal (blackheads) and develops through the subsequent leakage of sebum into the dermis. This has an irritating effect, causing an inflammatory reaction and the development of a red papule. Inflammation often leads to the production of pus, which forms a pustule or "pimple." Acne is fundamentally an inflammatory reaction to the presence of sebum as a foreign substance in the dermis. Bacteria may, at a later stage, cause infection.

Acne, like comedones, is most prevalent during adolescence, when heightened androgenic activity stimulates sebaceous excretion. People with oily skins usually have the worst problems. Diet is not a cause, but for many people certain foods, particularly chocolate, can worsen an acne condition. Mental stress can also aggravate acne. In girls there is usually an increase in acne prior to menstruation.

Because of the sterilizing action of the needle, treatment of an acne-infected follicle is not dangerous. Often treatment is advisable, because it eliminates any infectious fluids which could otherwise be transferred to treated follicles by drainage, wiping, scratching or the application of cosmetics. It also eliminates the cause of the eruption.

Mila (Whiteheads). A type of *retention cyst* wherein excretions of the follicle and sebaceous gland are entrapped beneath the epidermis (not in the follicle pore as with the blackhead). Whiteheads most often occur in dry, fine-textured skin, appearing on the face, neck and occasionally the chest and shoulders. They are not usually associated with hair-producing follicles.

Steatoma (Sebaceous Cyst). A subcutaneous tumor of the sebaceous glands, composed of sebum. The *wen,* as it is sometimes called, ranges in size from a pea to an orange, appears on the scalp, neck and back. Simply expelling the contents will never eliminate a sebaceous cyst; it should be surgically removed by a physician.

Seborrhea. An oily condition of the nose, forehead or scalp due to overactivity of the sebaceous glands, often accompanied by itching or burning.

Asteatosis. A dry, scaly condition of the skin due to a deficiency of sebum, usually associated with old age or an underlying disorder. It can be caused locally by the alkalies found in soaps and detergents.

Disorders of the Sudoriferous Glands

Like the diseases of the sebaceous glands, *disorders of the sudoriferous glands are not hazardous to the electrologist.* In some cases, however, the patron should consult a physician concerning the underlying cause. The most common are:

Bromidrosis or **Osmidrosis.** Foul-smelling perspiration, especially noticeable in the armpits or on the feet, caused by certain foods, drugs or an occasional rare disease. In such cases, the perspiration is produced by the sudoriferous glands. The condition may, however, be congenital, in which case it is the natural product of the *apocrine* sweat glands, which empty directly into the follicular pore and produce a naturally odoriferous substance. (The number of apocrine sweat glands an individual possesses is determined by racial or hereditary factors.)

Anidrosis. Lack of perspiration, frequently caused by fever or underlying disease.

Hyperidrosis. Excessive perspiration caused by debilitating disease, stimulants or neurasthenia (a general disorder characterized by mental depression and exhaustion).

Miliaria or **Miliaria Rubra (Heat Rash, Prickly Heat).** An acute inflammatory disorder of the sudoriferous glands, the lesions consisting of vesicles and papules, and often, but not always, accompanied by burning or itching of the skin. Prickly heat appears in hot weather and is especially prominent in the folds of the skin. Except for the added irritability this disorder may bring, it has no relevance to the electrologist's work.

Irregularities in Pigmentation

In her everyday practice the electrologist is confronted with a bewildering assortment of epidermal blotches, spots and discolorations. Most of these are merely alterations of the pigment, having no association with any infectious disorder. Listed below are the common types of blemishes which appear as the result of irregularities in pigmentation. No irregularity in pigmentation is hazardous to the electrologist, but she should be alert to the possibility that brownish spots or freckles may be produced by surface overtreatment.

Tan. A protective layer of pigmentation produced in the malpighian layer of the skin when activated by sunlight. A tan is believed to act as a sunlight barrier for the skin; thereby preventing harmfully excessive production of vitamin "D," which is also manufactured in the skin when stimulated by sunlight. Some people tan unevenly, developing a blotchy-looking epidermis.

Lentigines and **Freckles.** Some authorities use the terms "lentigo" (singular for lentigines) and "freckle" interchangeably, while others insist that lentigines differ from freckles in that they are not the result of exposure to sunlight, whereas freckles are. In either case, these are the yellowish or brownish spots which occur principally on the face, hands and arms and are popularly known by the name "freckles."

Chloasma. A yellow, brown or black deposit of pigment in the skin, occurring in patches of various shapes and sizes. Described popularly as "liver spots," chloasma is sometimes the result of endocrine imbalance. During pregnancy or uterine disease, chloasma will sometimes appear on the face in what is known as the *mask of pregnancy*. This reaction is also found among women taking contraceptive hormones.

Whenever a patron exhibits the mask of pregnancy, which usually appears as a yellowish to brownish strip of discoloration across the forehead and/or across the chin and throat, you must be sure to advise her that treatment may cause freckling in the discolored area. If the patron approves, test a few scattered follicles in the affected region to see if any small, pigmented spots result, before undertaking a regular treatment.

Stains. Abnormal patches of brown coloration of round or irregular shape. They often appear after moles or liver spots have subsided, after certain diseases or in old age. Cosmetology textbooks often mistakenly list the stain as a special type of lesion, but it is obviously a macule.

Nevus or **Birthmark.** A colored malformation of the skin resulting from a congential alteration in pigment or dilatation of superficial capillaries.

Leucoderma. An abnormal whiteness of the skin due to the absence of pigmentation, occurring either in patches or over the entire surface of the skin. Two common types are:

1. **Albinism,** a congenital absence of pigment from skin, hair and the iris of the eye. It may be localized, as *partial albinism* or generalized, as *total albinism*. Albinos are extremely sensitive to sunlight, lacking the ability to develop a protective tan.
2. **Vitiglio,** a skin disease characterized by loss of pigment, occurring most often in bands or patches on the skin or hair.

Hypertrophies

A hypertrophy of the skin is any unusual enlargement of the skin due to enlargement or multiplication of its constituent cells. Hypertrophies may occur for any number of reasons so that no general statement can be made about the hazards of treating a hypertrophy. Each of the general types must be considered individually, as listed below:

Keratoma (Callus). A hardened thickened patch of skin due to hypertrophy of the horny layer caused by irritation, friction or pressure; no problem to the electrologist, since hair is seldom present.

Keloid. An elevated fibrous hypertrophy occurring most commonly at the site of a scar. A skin reaction to injury, the keloid is a permanent lesion which will occur only on certain individuals who have a congenital predisposition to keloid. The electrologist should take note when a patron shows evidence of keloids. Overtreatment of follicles may result in keloids in some instances.

If the patron shows no sign of keloids on either the face or the body, there is no danger that she will keloid from your treatment. Any tendency to keloid would have shown itself by the time a person has reached adulthood. If keloids are found *only on the body,* there is little chance that the face will keloid from treatment. Every adult has had some form of facial eruption at some time or other, and if this has not produced a keloid, neither will an overtreatment, which causes no more injury than a severe pimple.

Keloids present on the face are a warning sign. They indicate that *excessive* treatment will produce more of the same. Negroes are especially prone to keloid. If the area requiring treatment shows keloids, the patron should be advised of the possibility of an occasional keloid from either treatment or any infection that develops. The decision to proceed with treatments rests with the patron. It is advisable to have her sign a release to that effect. (Your insurance company can provide you with release forms.)

Verruca (Wart). A skin tumor due to the uncontrolled multiplication of certain cells altered by the action of a virus. Psychological suggestion is implicated as a controlling factor. Warts most often appear on the hands although some (plane warts) appear on the face as well. Warts may be acquired through direct contact with them. The electrologist should never work on or near a wart unless she intends to remove it (a practice permitted only in certain states).

Mole. A small congenital macule ranging in color from pale tan to brown or bluish black. Often moles contain deep terminal hairs because of a well developed vascular system. Little more than one mole in a million becomes malignant each year, with the incidence slightly higher on exposed parts of the skin and in sunny parts of the world. Hairy moles are usually safe even when they enlarge as is often the case with menopausal women. Furthermore, the myth is not true that tampering with a mole makes it malignant.*

The true malignant mole is the melanoma, which is a black, blue-black or slate-colored lesion, lacking hair and possessing a smooth and shiny surface. This becomes the highly malignant melanocarinoma. Because moles which have been normal for years may suddenly become malignant, any mole exhibiting the following symptoms† should receive immediate medical attention:

a) Increase in size.
b) Increase in depth of pigmentation and its extension into the surrounding skin.
c) Crust formation or bleeding.
d) An inflammatory ring of color around the mole.

If, in the course of an extensive treatment, the patron requests treatment of a hairy mole, have her consult her physician or dermatologist and obtain permission. To protect yourself legally, have the permission written or telephoned directly to you. Although hairy moles are not the type which become malignant, many liability insurance policies become null and void in the event of a legal suit arising out of the treatment of moles. When a qualified specialist grants his approval, he is assuming the legal responsibility for the treatment. (Obviously, such approval is worth obtaining only if the patron requires extensive work in areas other than on the mole; simple hairy mole cases are best off being referred to a dermatologist or physician for treatment, since these specialists are equipped to remove the mole as well as the hair.)

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*Sneddon and Church, *Practical Dermatology* (London, 1964). See p. 175.

†Sneddon and Church, *Practical Dermatology* (London, 1964). See p. 175.

GENERALLY THE MOLE WHICH IS RAISED FROM THE SURFACE OF THE SKIN MAY HAVE HAIR REMOVED FROM THEM. THE

SECTION TWO: POST TREATMENT DISORDERS

It is not uncommon for a patron to return to you after a treatment and claim that electrology has been the cause of recent eruptions on her skin. Sometimes she will be right, if for example, you have over-treated several follicles and caused eschars to appear. Often, however, the recent appearance of lesions on the skin is the result of a *pre-existing* condition. And it is sometimes the result of unsanitary practices on the part of the patron after treatment. These latter cases may be serious, and it is important for you to be able to distinguish a lesion produced by electrology from one arising from other factors.

The first thing to do when confronted with a post treatment disorder is to examine the way in which the lesions are distributed over the skin. Any problem caused by electrology will manifest itself at the site of isolated follicles or groups of follicles. If the disorder is generalized throughout the entire area, suspect other causes. Listed below are the most common causes, other than treatment itself, which may give rise to a skin disorder during or following a series of treatments.

Pre-existing Infection. One of the easiest ways for disorders to develop in a treated area is for the patron to transfer infection to it from another part of the body already infected with some disease. This is why it is always important to advise the patron not to scratch, rub or irritate a treatment area until the skin has had a day or two to heal from treatment. Any of the more infectious disorders listed in Section One is capable of infecting recently treated follicles, ringworm being high on the list. In fact, treated follicles need not be implicated at all; the patron may simply acquire or transfer disease to areas formerly treated by you and mistakenly conclude that electrology caused it. Poison ivy or poison oak could be transferred in this way. Whenever suspicious-looking lesions appear in the treated area, ask the patron about any other odd skin conditions she may have on other parts of the body. If the condition looks at all serious, direct her immediately to her physician, or preferably, to one who is acquainted with your work, if hers is not.

Contact Dermatitis. This form of hypersensitivity, which we touched on briefly in Section One, is not caused by treatment with electrology. Its causes are substances which, over a protracted period of time, bring about a sensitization of the skin not only to themselves but often to other substances as well.

If you have been working successfully with galvanic current on a case for several months before the patron, for no apparent reason, begins to break out in the treated area, it is quite possible that the patron has developed a special sensitivity. Galvanic lye is a chemical to which some hypersensitized skins can become allergic. In such cases, the best course of action is not to use galvanic current at all. If the condition disappears after treatments have been shifted to straight high-frequency current, you will know that the problem was an allergic reaction to the lye created through contact with it or some other substance.

Diagnosis is made difficult by the fact that contact dermatitis may be the effect of many things other than galvanic current. If the eruption occurs in the spring or summer, for instance, it could be a case of *actinic light dermatitis,* a cross-sensitization to sunlight brought about by certain ingredients in cosmetics or drugs. At any time of the year, eruptions could indicate a sensitization brought on through continual contact with certain soaps, perfumes, cosmetics or other common household articles. The specific cause is often very difficult to track down because the patron may have been using the item for many years before the sensitization developed to a noticeable extent. The problem is further complicated by the fact that contact dermatitis seems to occur often during emotional crisis. Listed below are the likely causes of contact dermatitis for each general area normally treated by the electrologist:*

Scalp: Hair dyes, brilliantines and scalp lotions.

Ears: Scalp applications, hair nets, spectacle frames, ear clips, hearing aids and ear drops.

Eyelids and face: Plant sensitivity, airborne dusts, volatile chemicals, cosmetics, soaps and nail polish.

Neck: Ties, scarves, furs, necklaces (especially those with nickel or chrome clasps), nail polish (from the habit of resting the chin on the hand) and perfume.

Axillae: Clothing, rubber arm shields, deodorants.

Trunk: Clothing, rubber foundation garmets.

Thighs: Nickel, chromium or rubber garters, articles carried in pockets.

Ankles and feet: Socks, rubber and metal foot supports, chemical dusts, rubber boots and shoes, dyes and adhesives used in shoe manufacture.

Hands and forearms: Innumerable materials handled at work or at home, plant sensitivity and rubber gloves.

The above items could be the direct cause of lesions or the indirect cause through cross-sensitization. Most cases will have to be diagnosed and treated by a qualified practitioner.

Dermographia. This condition is easily distinguished from all others by the fact that it manifests itself shortly after treatment and seldom

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*From Sneddon and Church, *Practical Dermatology* (London, 1964). See p. 21.

remains noticeable for more than two hours. A form of urticaria, dermographia is a congenital sensitivity to any form of scratching or friction on the skin. Its name means literally "writing on the skin," which can actually be done by tracing a word with the fingernail across the epidermis. Whealing is caused by the leakage of plasma from dialated capillaries into the intra-cellular spaces of the dermis. The condition is promoted or aggravated by emotional anxiety.

On several occasions, it has been the case that patrons, whose lips have been worked on, have returned the next day with lips still swollen. It was determined, by making several insertions using no electrical current at all, that the mere insertion of the needle—not the application of the currents—was the cause. Because the swelling was generalized and because it lasted for twenty-four hours, the cases were not exactly dermographia, but a similar type of sensitivity to external irritation. Nervous response may be involved. Whenever a patron manifests such a reaction, leave it to her to decide whether the permanent removal of lip hair is worth the temporary flaw in her appearance. There are no lasting effects.

Dermatitis Artifacta. This is one problem that every electrologist should be able to recognize for her own self preservation. Fortunately it is a very infrequent problem. Dermatitis artifacta is nothing other than a lesion or collection of lesions produced on the skin by the patron's own hand. These are usually a manifestation of neurosis or hysteria but are occasionally inflicted for financial gain (by threat of legal action).

Suspect any lesion which has an unnatural shape (square or rectangular) not associated with any disease. Whenever a suspicious case turns up, always refer the person to her own doctor, explaining that electrology will not produce such lesions.

Post Treatment Inflammation

No matter what method she employs, each time an electrologist treats a follicle she is destroying epidermal tissue. This means that after every treatment a small amount of tissue at the site of each treated follicle will be susceptible to infection until it heals through natural processes. Whether or not an infection does develop depends almost entirely on the patron. The treatment itself is a self-sterilizing process and is followed by a sanitizing application of antiseptic. Home care by the patron is therefore of greatest importance.

The first thing that happens after a follicle is treated is the development of inflammation (redness). This is initially characterized by local irritation, followed by an increase in blood supply to the affected part.

If the irritation is severe the flow of blood through nearby capillaries comes almost to a standstill, impeded by a mass of red corpuscles which fill the dilated vessels. This manifests itself in the redness which will appear temporarily around some treated follicles. Leukocytes (white corpuscles) meantime migrate in large numbers through the walls of the capillaries to do battle with any invading bacteria. Unless the follicle has been overtreated, inflammation will occur on a very minor scale.

If bacteria should later invade the follicle because of some unsanitary practice on the part of the patron, inflammation will recur on a larger scale. Local redness, heat, swelling and pain will result from the irritation of bacteria-caused poisons. Under these conditions the leukocytes and bacteria engage in mortal combat. If the leukocytes are victorious, all signs of the bacteria are removed. If they are not, the bacteria will destroy large numbers of tissue cells, causing the formation of pus. Pus consists of dead and living bacteria, destroyed tissue and material from the blood vessels. It is an obvious sign of infection.

The first stage of pus formation in the follicle is reflected by the presence of *pustules*. These are no more than little yellow-headed pimples, which the patron should treat to contain any infection in them. Normally, the pustule will disappear in a day or two, leaving a honey-colored crust which will itself drop off leaving no scar or pit if left until the epidermis has healed.

If the follicle becomes severely infected the condition may worsen into a second stage, *folliculitis*, which involves a large pocket of pus in the skin. If the pus lies between the horny layer and the rest of the epidermis, it is called *superficial folliculitis*. When kept clean and properly cared for, this condition will not leave a scar. *Deep folliculitis*, on the other hand, is much more severe. It involves an infection of the entire

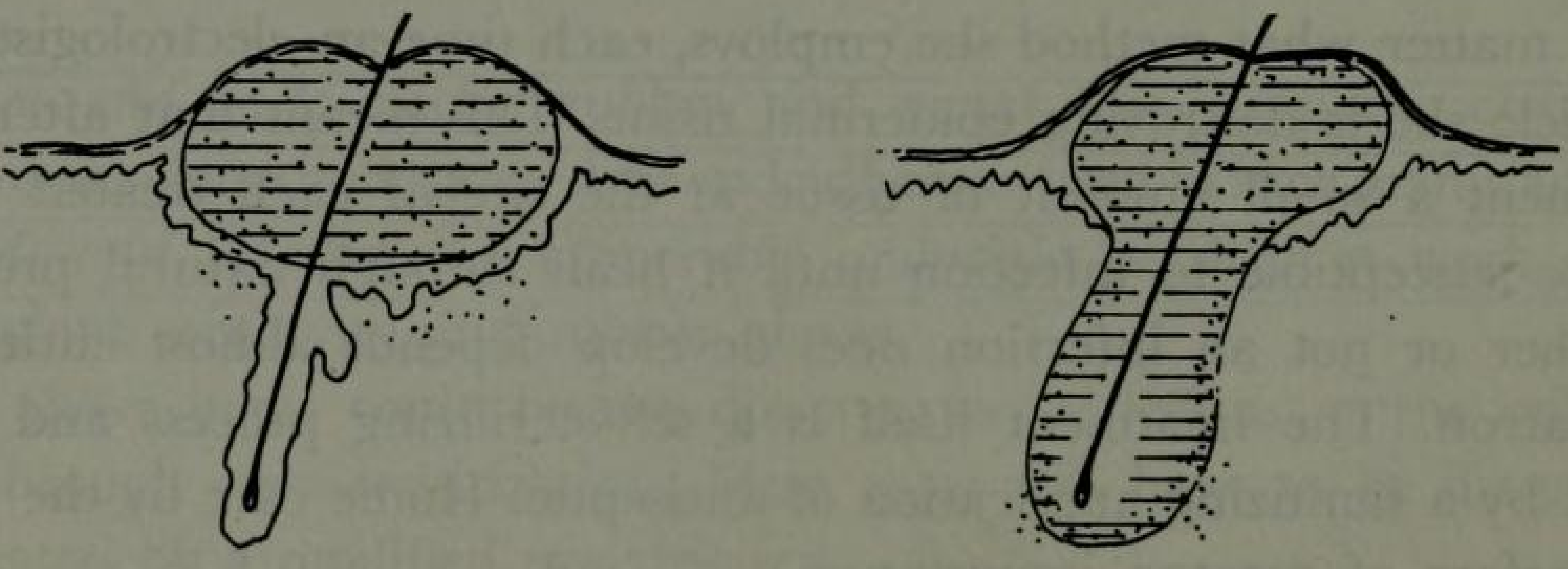

Superficial folliculitis
Deep folliculitis

FIGURE 53. *Folliculitis.*

follicle as well as the superficial area. When this lesion heals, a pit in the skin is often left behind. *Impress upon your patron the importance of home care of her skin after treatment.*

Folliculitis, it must be added, can be caused by factors other than electrology treatments. An infected follicle occurs more often than not as the result of an ingrown hair. Look for instances where hair is circling back into the skin. This is a hereditary trait found most frequently where curly or kinky hair is present. Treatment of ingrowing hairs is discussed in Chapter XII.

Normal Healing of Treated Follicles

The formation of crusts at the site of treated follicles is a frequent problem in our work. While it is rare in face work, it is a common experience in body treatments for the electrical action of the needle to cause a little crust-forming lymph to be exuded into the treated follicle from adjacent blood vessels. This means that the follicle has been heavily treated and that the epidermis must therefore heal from the bottom up.

A honey-colored lymph crust or eschar at the surface of a follicle indicates that normal healing is going on inside the follicle. The crust is a natural form of protection for the healing process. As long as the crust is left on, the cavity which lies beneath it will rebuild to the level of the surrounding epidermis. If the crust is picked off prematurely, normal healing will be arrested, and the unhealed portion of the depression will remain a pit for many years. *Be sure to remind each patron that no crust which forms over a treated follicle should ever be picked off.*

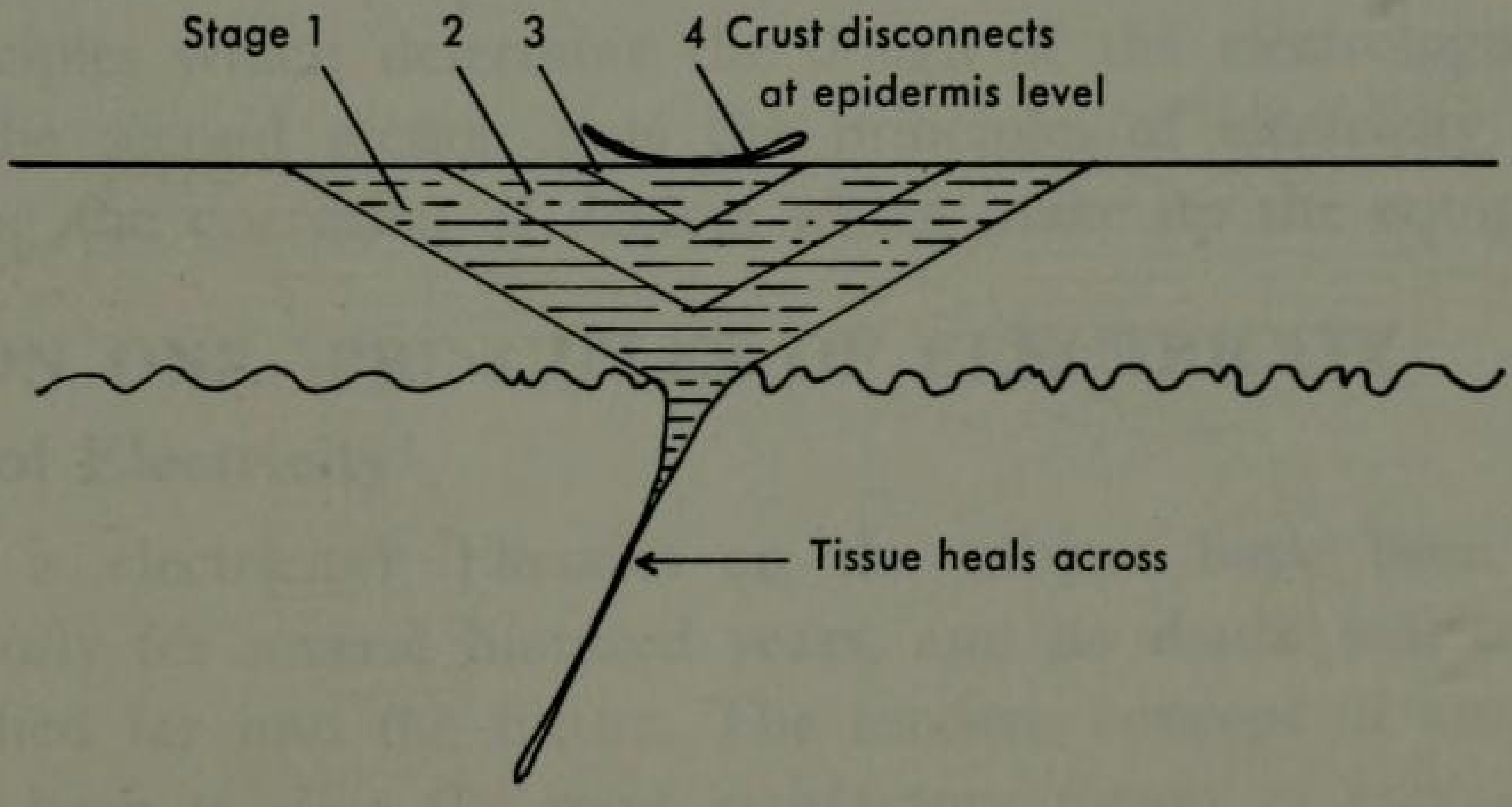


FIGURE 54. *Stages of skin healing beneath lymph crust.*

Summary

The greatest hazard following any treatment by an electrologist is the possibility that the patron may infect the work herself, once she has left the office. Each treated follicle is a potential breeding ground for infection, and even the healthiest of skins is ridden with bacteria. Yet it is impossible for the electrologist to provide a protective covering for the vulnerable area. The safety of giving treatments to anyone—and especially to those who already have an infection of some kind—is basically dependent on how well the patron understands the hazards of transferring infection to open follicles. This, in turn, requires an emphatic effort on your part to make the patron aware of the importance of home care. Special home care instructions are provided in Chapter XII for this purpose.

Chapter VII

Principles of Electricity and Equipment

It is the science of electricity which has made the art of hair removal possible. Therefore the practitioner who lacks understanding of the principles of electricity is something like the classical "midwife"—an artisan possessing considerable skill but little technical knowledge. Although this might suffice for a medieval environment, it is hardly satisfactory in an age of rapid technological advancement. In electrology, as in any other trade or profession, the practitioner must have a good grasp of the fundamentals of her field in order to be able to change and "grow" as new developments are made available for use. It is especially valuable to her in evaluating new products and ideas as they appear on the market. There is always some new but worthless "gadget" to lure the unsuspecting electrologist.

This chapter on electricity has been divided into two sections. The first deals with the properties and behavior of electricity. These are the principles which determine the design of the electrologist's equipment. The second section puts the principles of electricity to use in explaining the operation of devices which make up the equipment.

SECTION ONE: PRINCIPLES OF ELECTRICITY

Theory of Electricity

What is electricity? Theories on the subject have been changing continuously for several hundred years, and no doubt will continue to be modified far into the future. The modern concept of atomic structure has been to date the most satisfactory means of explaining electrical phenomena.

According to this theory, all that is material in the world—all that can be touched, seen, tasted, heard, or in any way sensed—is constructed of minute "building blocks" called *molecules.* The molecule is the smallest unit of matter into which a substance can be divided without losing its basic properties. One molecule of water (H_2O), for instance, is still essentially water.

When molecules are further divided into *atoms,* however, their basic properties change. For example, a water molecule (H_2O), will break into two hydrogen atoms (H) and one oxygen atom (O), which have entirely different qualities from water. The atom is further divisible into so-called "sub-atomic" particles, many of which have been discovered through giant "atom smashers." These particles are known only in terms of mass, velocity and electrical charge. Suffice it to say, only the most basic of these can be discussed here.

Atomic structure, as it is currently conceived, consists of a center, or "nucleus," around which rotates one or more *electrons,* which are tiny specks of negative electricity. The electrons swing around the center in much the way satellites have been swinging around the earth. In its stable state, the atom contains one positively-charged proton in the nucleus for every negatively charged electron in orbit.

Figure 55 illustrates somewhat the general construction of one of the simpler atoms. The distance between the nucleus and the atom is really much greater than implied here. If, for example, the protons were the size of tennis balls, the tinier electrons would be orbiting them at a distance of nearly four miles. (By this conception there is more space than matter in things.)

Electron Theory of Electricity

According to the electron theory, everything which we experience as an electrical phenomenon, such things as lightning, electrical sparks and

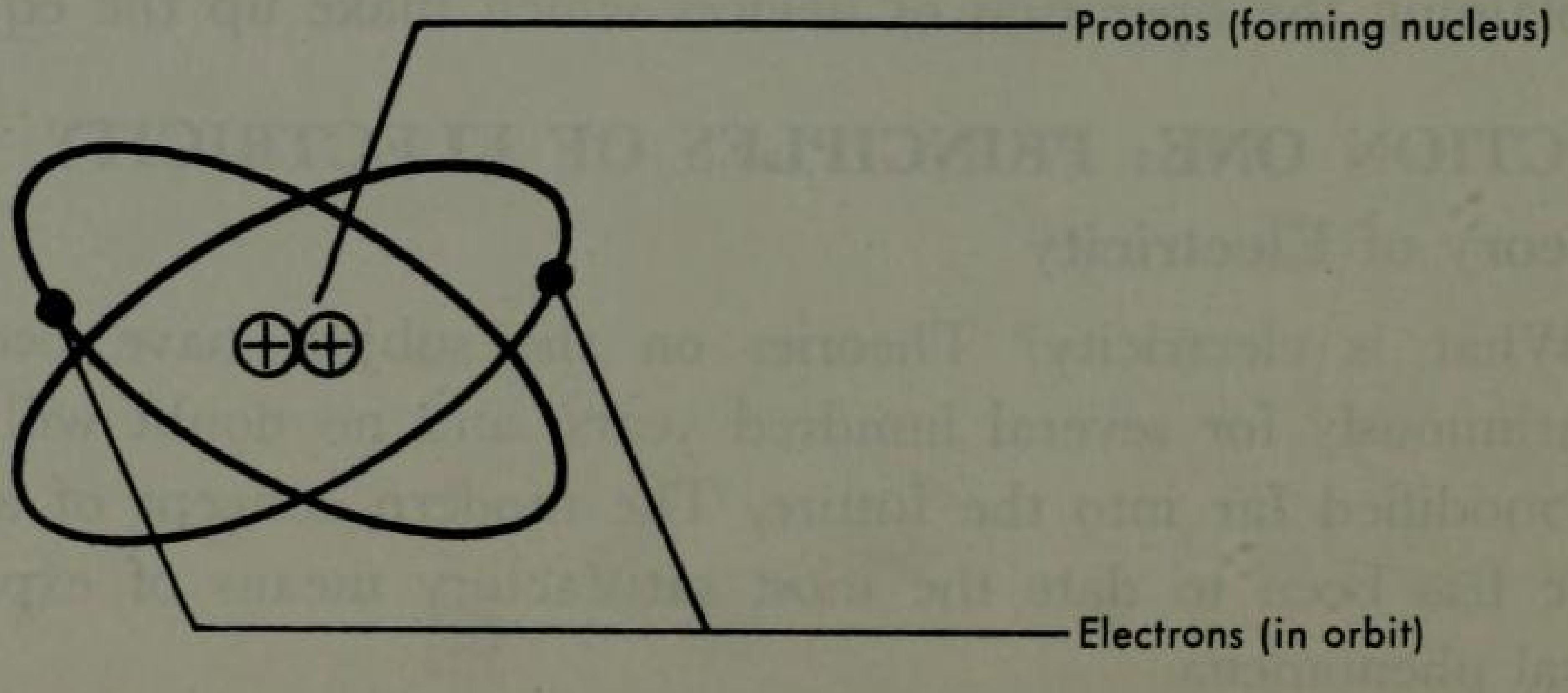


FIGURE 55. *Model of simple atom (helium).*

magnetism, are due to the peculiar activity of electrons. For electrons are not necessarily "fixed" in their orbits; in many substances it is possible for an electron to leave one atom and jump into orbit around another. This can happen under a number of circumstances and in a number of ways. The most dramatic example is lightning, in which trillions of electrons simultaneously leap from one set of atoms to another, often over distances of several miles.

The exchange of electrons is explained in terms of attraction and repulsion. Electrons, being "negative," are attracted into orbit around protons, which are "positive." (Unlike charges attract one another; like charges repel.)

When an atom contains as many electrons as it has protons, the power of the nucleus to attract electrons is neutralized. However, should an atom lose any of its electrons, the atom as a whole would acquire a positive charge, tending to attract the number of electrons necessary to make it "stable." If, on the other hand, an atom gains an excess of electrons, it becomes negative in charge, repelling any "loose" electrons that might stray near it. Atoms which have an excess or a deficiency of electrons are called, respectively, negative and positive *ions* (which because of their opposite charges, are themselves mutually attracted). Normally only one electron will be gained or lost in forming an ion.

Polarity and Electron Flow

Because of the odd nature of electrical charges, electrons will always jump from an area of excess electrons toward an area where there is a deficiency of them. You might think of them as behaving like water, which always levels itself. Water poured into a pan quickly settles evenly throughout the pan, without lumps or hills. Just so, the electricity in an object tends to distribute itself evenly throughout the object. Thus

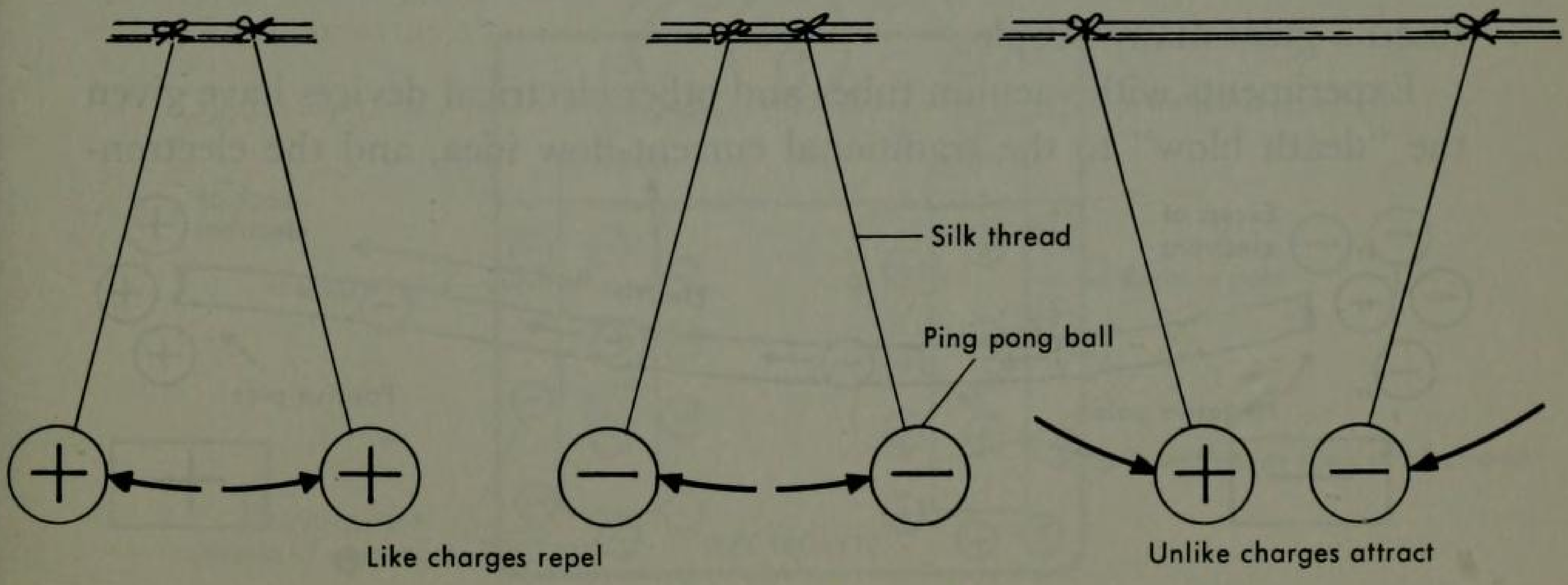


Figure 56. *Attraction and repulsion of charges.*

electrons will always flow through an object such as a copper wire, from the equalizing "pressure" created by the presence of more electrons at one end than at the other, just as water poured into one side of a pan will rush to the other side until equalized.

Figure 57 shows how this imbalance effects electron flow. Such a condition is called polarity. A "polarized" conductor has two *poles*, the *positive*, which lacks electrons, and the *negative*, which has too many. *Electrons always flow from negative to positive.*

Current Flow vs. Electron Flow

The discovery that electrons flow from negative to positive created one of the biggest practical problems to arise out of the modern theory of electricity. Until the end of the nineteenth century, when Sir J. J. Thompson discovered small packets of negative electricity called electrons, it had been assumed that electrical "current" flows in the opposite direction, from positive to negative (a theory introduced by, of all people, Benjamin Franklin).

Unfortunately, most of the electrical formulae in practical use today had already been developed prior to the discovery of electron flow. They had therefore been formulated in terms of the "current" flow theory. Reluctant to revise existing formulations, engineers and electricians alike have totally confused the issue by vacillating between the two conceptions of flow. Some electrical diagrams have arrows indicating current flow through a circuit from the positive battery terminal to the negative terminal. Others show electrons flowing from negative to positive. One seldom finds a modern textbook on electrotherapy that does not insist that electrons flow from negative to positive while (apparently simultaneously) "current" flows from positive to negative. Even State Board tests include questions about this "current" flow. Ben Franklin's mistaken hypothesis has confused a great many people.

Experiments with vacuum tubes and other electrical devices have given the "death blow" to the traditional current-flow idea, and the electron-

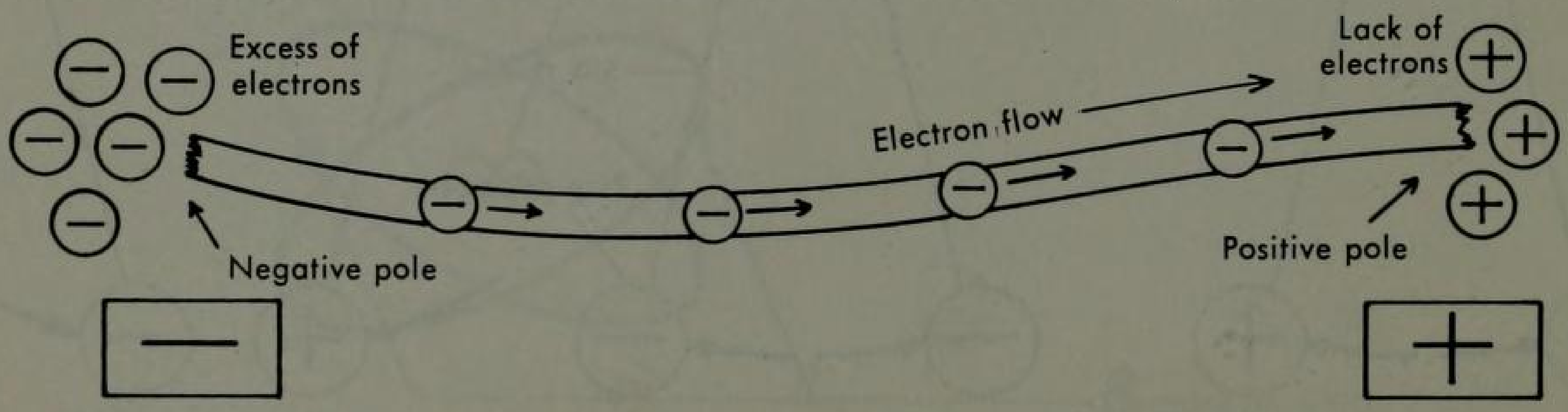


FIGURE 57. *Electron flow—polarity.*

flow concept is gradually being accepted. Yet it is wise to keep in mind that such a distinction exists, and that situations will arise wherein one will have to interpret problems in terms of current-flow. In this book the term "current" shall be employed to designate a quantity of electricity flowing through a conductor, without regard to direction of flow.

Cells, Batteries and Direct Current

One way to produce an electric current is by chemical action. As early as 1800 the Italian physicist, Volta, had devised the first chemical cell to successfully deliver a continuous electric current. The *wet cell* (or *Voltaic cell*) consists simply of two dissimilar metal plates, usually copper and zinc, submerged in a chemical solution called an *electrolyte,* which contains both positive and negative ions.

The nature of the electrolyte is such that positive ions tend to collect around the copper plate while negative ions build up at the zinc plate. Because the wire connecting the plates will conduct electrons, the excess electrons at the zinc (negative) plate rush toward the copper (positive) plate. In effect, the electrolyte is pushing electrons onto one plate and taking them off the other. The resulting flow of electrons through the wire is called *direct current* (D.C.) because it always moves in one direction.

A *dry cell* is also a chemical source of direct current. Instead of employing a liquid electrolyte, however, it consists of a zinc case used as the negative plate, a carbon rod for the positive plate and a moist paste of ammonium chloride for the electrolyte. This is the kind of cell used in flashlights. Until recently, dry cells could not be recharged; but now a number of rechargeable dry cells are on the market. A "dry" cell is not really dry — it contains moisture in paste form and therefore is portable

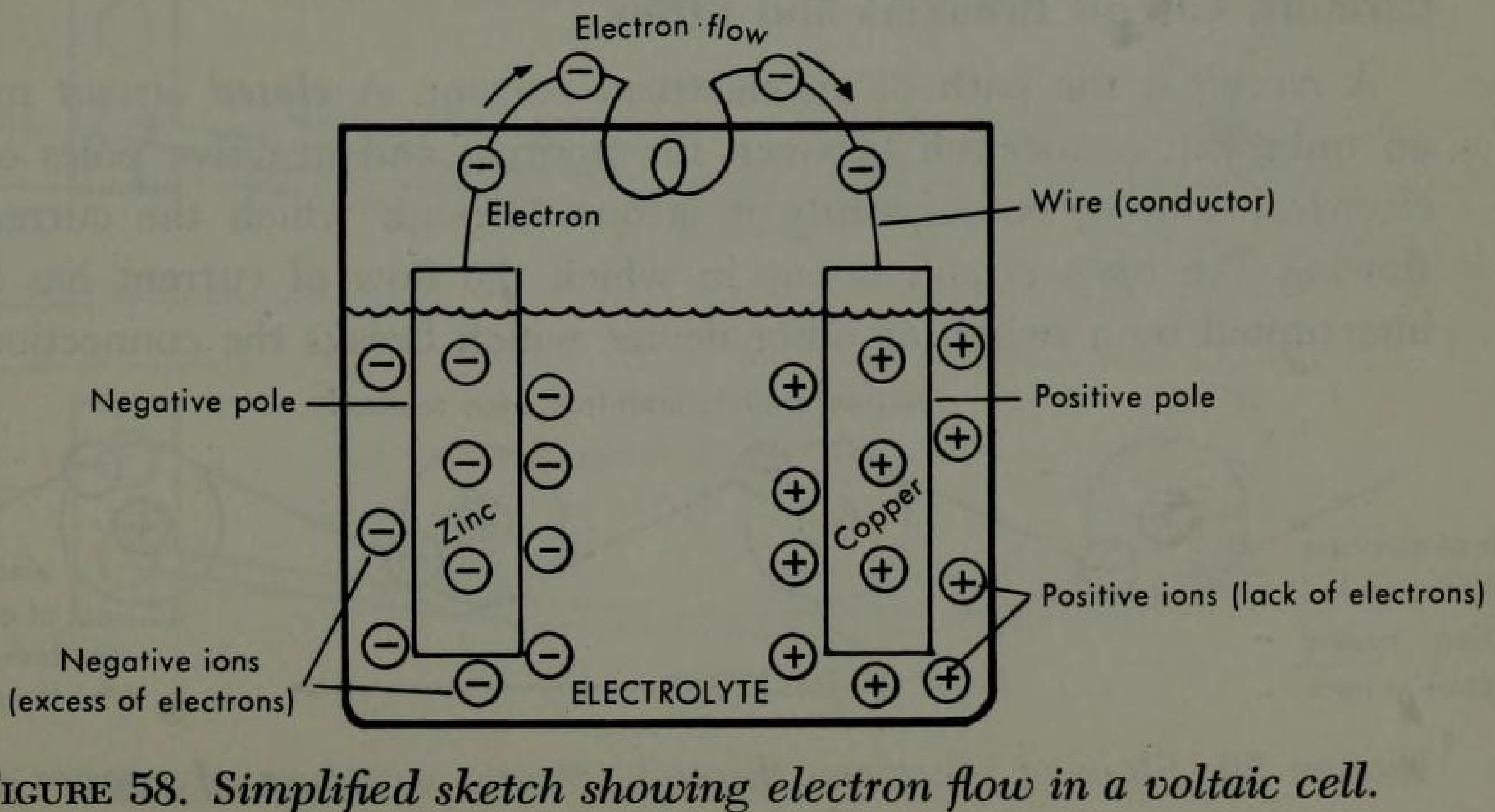


FIGURE 58. *Simplified sketch showing electron flow in a voltaic cell.*

and does not spill as a wet cell would. The useful life of a dry cell ceases when the internal moisture (electrolyte) evaporates or when the metal plates which act as a "fuel" are consumed. A *battery* is two or more cells, wet or dry, connected together to furnish larger amounts of electricity.

Conductors and Insulators (Non-conductors)

A *conductor* is a substance that will readily conduct the flow of electrons when there is electrical "pressure" in a given direction. Among the best conductors are copper, zinc, brass, carbon and water. An *insulator* is the exact opposite of a conductor in that it will not transmit electricity at all unless the amount of electricity to which it is subjected exceeds a certain limit. Rubber, plastic, glass, asbestos, and dry wood are all considered insulators or "non-conductors" under normal conditions. It can be seen why electrical wires made of copper, which is a good conductor, and surrounded by plastic, which is an excellent insulator, are both efficient and safe.

Electron theory explains how a substance such as copper makes an efficient conductor. In the copper atom there is one electron which orbits the nucleus at a relatively long distance from the nucleus. This electron could be easily induced to jump into orbit around a neighboring nucleus. Therefore, when millions of these atoms are strung out in the form of a wire between two electrical poles, the attracting power of positively-charged ions at the positive pole can readily pull neighboring copper electrons out of their own orbits. At the same time the excess of electrons at the negative pole will be pushing into the wire conductor. The result is that the electrons will hop from atom to atom just as buckets are handed from man to man in a bucket brigade.

Circuits, Circuit Breakers and Fuses

A *circuit* is the path of an electrical current. A *closed circuit* makes an unbroken connection between the positive and negative poles of an electrical source; consequently it is one through which the current is flowing. An *open circuit* is one in which the flow of current has been interrupted by a switch or other device which breaks the connection. It

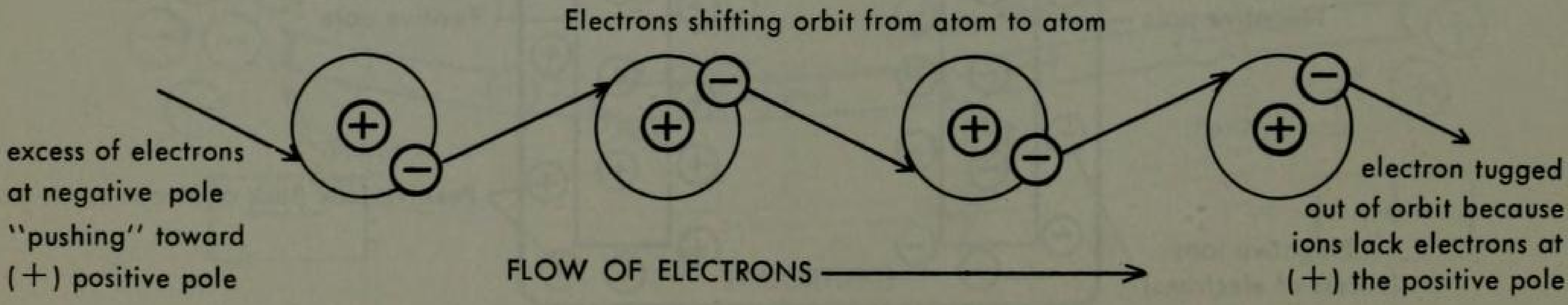

Electrons shifting orbit from atom to atom
excess of electrons at negative pole "pushing" toward (+) positive pole
+
−
FLOW OF ELECTRONS
electron tugged out of orbit because ions lack electrons at (+) the positive pole

FIGURE 59. *Flow of electrons through atomic structure of copper wire.*

could also be caused by a broken copper wire which does not permit the flow of current. (When current is used for cosmetological purposes, and is passing through the patron's body, it is known as a *complete circuit.*) A *short circuit* occurs when the current is not completing its path through its prescribed course but rather takes a "short cut" via a break in the insulation. See Figure 60.

To prevent the danger of short circuits, the *fuse* and, more recently, the *circuit breaker* have been developed to control the amount of current flowing through a circuit. In either case, the device is a part of the continuous circuit which will break the flow of electricity if the current becomes excessive. A fuse is made of a material which quickly melts from too much current, thereby creating a gap across which the current cannot flow.

The circuit breaker is a switch operated automatically by an electromagnet. The greater the current, the stronger the magnet. At that point at which the current is likely to be of a dangerous intensity the magnet becomes powerful enough to pull open the switch, instantly breaking the circuit. Some circuit breakers are activated by a sort of thermostatically controlled latch that trips open due to the heat produced by excessive current flow.

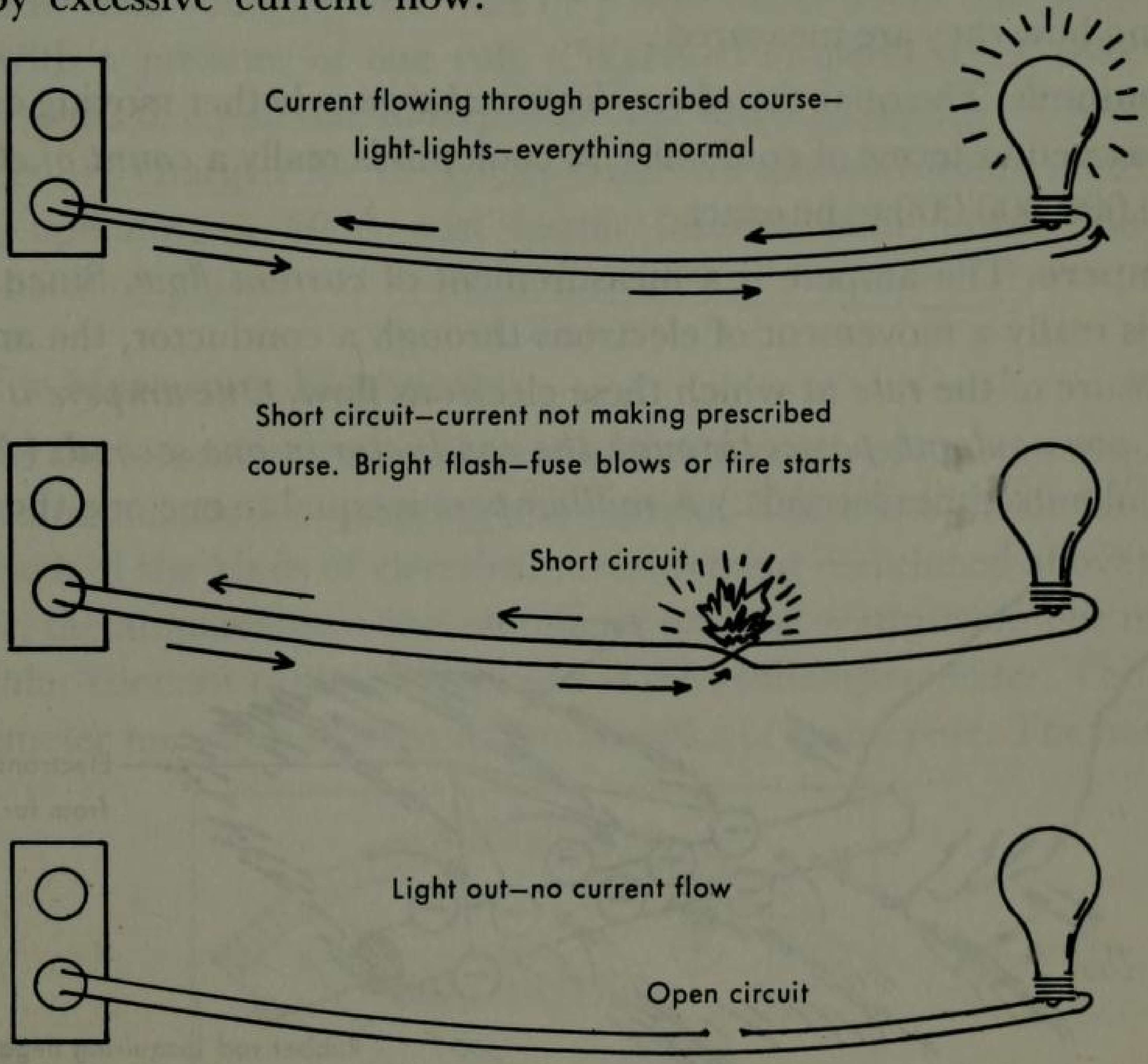

Current flowing through prescribed course—
light-lights—everything normal
Short circuit—current not making prescribed
course. Bright flash—fuse blows or fire starts
Short circuit
Light out—no current flow
Open circuit

FIGURE 60. *Electrical circuit—normal, open and short.*

Static Electricity

We often encounter *static electricity* in our daily lives. When you brush your hair on a cold dry day, have you ever noticed how it crackles with the sound of little sparks? It also tends to fly around and stand out in an annoying way. These effects are due to static electricity produced by brushing; you have electrified your hair.

Static electricity is merely *electricity at rest.* In brushing your hair or shuffling across a thick carpet or in any way rubbing certain substances, you are sweeping the *electrons* from other substances and depositing them on yourself; you actually acquire a negative charge. The spark you sometimes see after doing this is the excess of electrons leaping to something which is "grounded." As in dynamic electricity, *unlike charges attract each other and like ones repel.* Static electricity develops only on non-conducting substances like glass, rubber, etc., since any excess of electrons on a conductor will be conducted right back to the source without having a chance to build up.

Measurement of Electricity

Having seen how electricity behaves, let us examine some of its properties and how they are measured:

Coulomb. The quantity of an *electric charge*, whether moving or at rest, is measured in terms of coulombs. A coulomb is really a *count of electrons,* 6,280,000,000,000 to be exact.

Ampere. The ampere is a measurement of *current flow.* Since current flow is really a movement of electrons through a conductor, the ampere is a measure of the *rate* at which these electrons flow. *One ampere is flowing when one coulomb passes through the conductor in one second.* (Amperes = coulombs times seconds.) A *milliampere* is equal to one one-thousandth

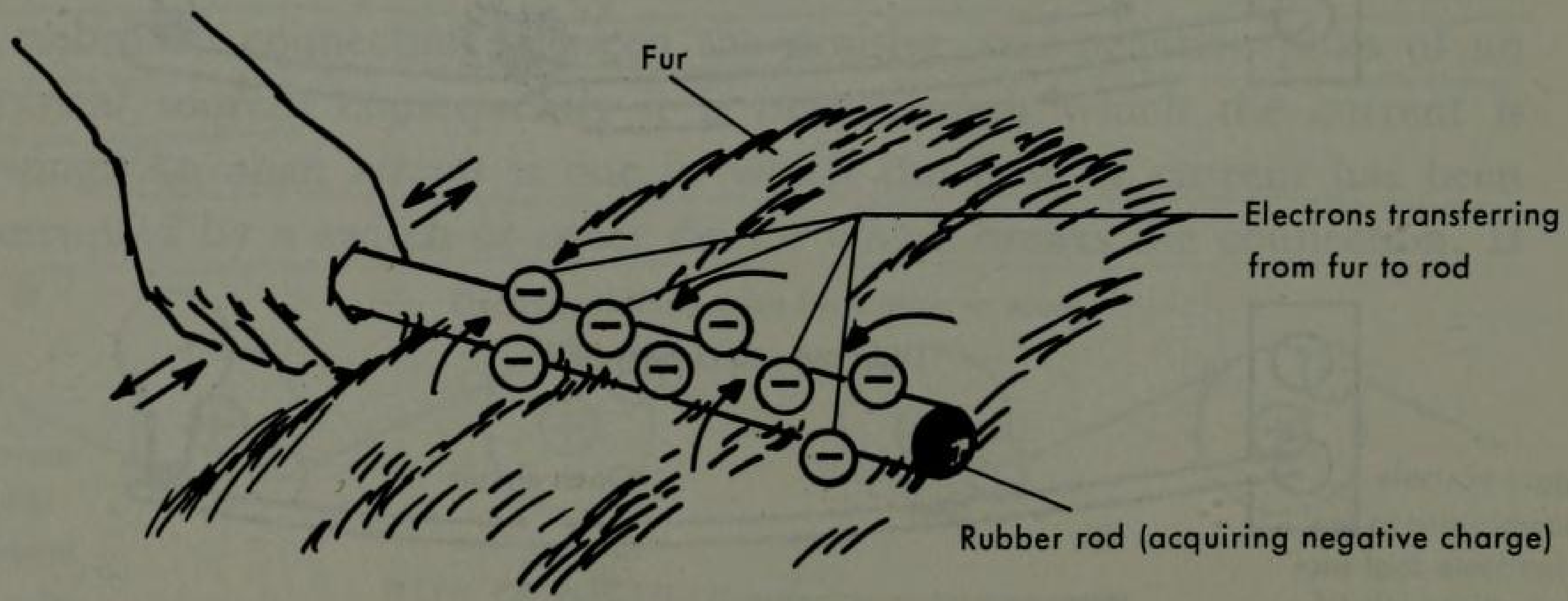

Fur
Electrons transferring from fur to rod
Rubber rod (acquiring negative charge)

Figure 61. *Static electricity forming on a rubber rod rubbed against fur.*

of an ampere. Because of the tiny charges of electricity used in electrology the milliampere is the measure most commonly referred to.

Volt. The "pressure" or force resulting from unequal distribution of electrons in a conductor is called *voltage.* The greater the difference in potential between positive and negative poles, the greater the voltage. The volt is a unit measurement of potential difference or *electrical pressure.*

Ohm. Some materials are better conductors of current than others. We would say they offer less *resistance* to electrical pressure. The ohm is a unit that measures the amount of resistance. In effect, it indicates how large a voltage is necessary to push a given current through a conductor. Ohm's law precisely formulates the relationships of current, pressure and resistance:

OHM'S LAW

It takes the pressure of ONE VOLT
to push a current of ONE AMPERE
through a resistance of ONE OHM

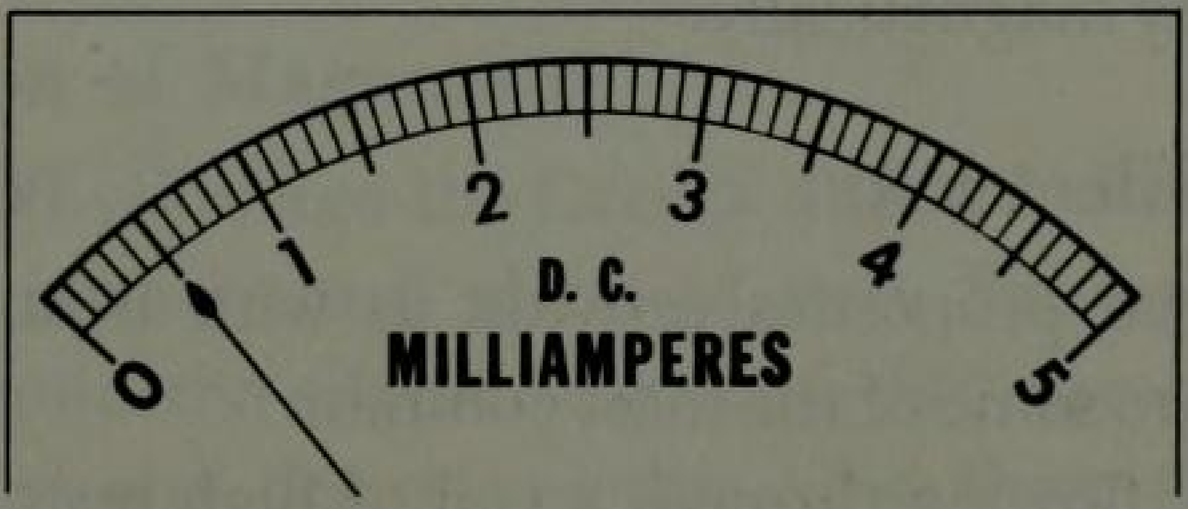
(OR)

VOLTAGE = CURRENT times RESISTANCE

Watt. The watt is a unit measure of *power.* It therefore involves both current flow and voltage. One watt of power exists when one ampere is flowing with a pressure of one volt. (Watts = amperes times volts.) It takes 746 watts to equal one *horsepower.* The *kilowatt* equals 1,000 watts. Consumers are charged for electricity based on kilowatt hours used. For example, operating a 1000 watt heater for one hour would use one kilowatt-hour of power.

Meters for Measuring Electricity

None of the formulae concerning units of measure is of any practical use without some means of measuring the current. There is a meter for calibrating each of the kinds of electrical measurement mentioned above: the voltmeter, the amperemeter, the ohmmeter and the wattmeter. The meter of particular concern to the electrologist is the *milliamperemeter.* The milliamperemeter measures current in thousandths of an ampere. The normal



1 ma. = $\frac{10}{10\text{ths}}$

Note – between 0 and 1 there are 10 divisions therefore each black line is $\frac{1}{10}$ of one ma.

FIGURE 62. *Milliamperemeter.*

range of current that is usually applied to the follicle does not go beyond three milliamperes.

Classification of Electricity

Cosmetology and electrotherapy books often confuse the student by classifying electricity into categories which are illogically related. For example, one "authority" on the subject categorizes electricity into "static" and "magnetic" (rather than "dynamic"). To avoid confusions of this sort, the basis of classification must be clearly stated. There are at least two possible ways of classifying electricity; by state or by means of production:

State. In terms of motion there could only be two classifications.

(1) *Static electricity* is electricity that is at rest; an excess of electrons deposited on some object.

(2) *Dynamic electricity* is electricity in motion; the flow of electrons either through a conductor or a vacuum.

Production. Like any other form of energy, electrical action does not just "pop" into existence. It has to be the result of another form of energy. Although there are other possible sources, we list here six of the most common:

(1) *Friction.* By rubbing two materials together an electrical charge can sometimes be produced.

(2) *Pressure.* Electricity may be produced by applying pressure to a crystal of certain substances.

(3) *Heat.* Heating the junction of a thermo-couple produces a current.

(4) *Light.* When light strikes a photo-sensitive cell, current is produced.

(5) *Magnetism.* When a wire and a magnet are in motion relative to each other, a current is induced in the wire.

(6) *Chemical action.* The action of chemicals in an electric cell will cause a flow of current.

Of the six named above, only magnetism and chemical action are practical sources of power. Atomic energy is now being used in steam generators to produce electricity magnetically.

Common Uses of Electricity

Electricity's special properties provide us with a number of practical uses. Listed below are some of the most common:

Heat. Electricity flowing through a coil of high resistance can generate considerable heat. This principle is utilized in electric irons, hot pads, electric blankets, etc.

Lighting. The incandescent bulb gains its brilliance through the effect of electricity flowing through special carbon-tungsten alloy filaments. Fluorescent lighting results from current flowing through gas-filled tubes.

Mechanical Power. By use of the electro-magnet, almost any kind of mechanical operation can be accomplished with electrical energy. Electrical motors can do everything from brushing your teeth in the morning to operating the mechanism that keeps the refrigerator cold.

Radiation. It is the peculiar propensity of electricity to give off waves of radiating energy under certain conditions. Such useful phenomena as ultraviolet rays, infrared rays, x-rays, laser beams, radio and television have been brought about through the control of these radiations.

Chemical Action. The introduction of electrons into a chemical solution can cause a change in the molecular structure of the chemicals by ionizing the atoms. This process, called *electrolysis* is the basis for the galvanic destruction of the follicle, to be discussed in greater detail in Chapter VIII.

Physiological Effects. By controlling the flow of current, a variety of beneficial effects can be achieved through electricity. These include: improvement of general metabolism, relaxing sensory nerves, hyperemia in the skin and stimulation of circulation. Of particular interest to the electrologist, however, is *phoresis.*

PHORESIS

Phoresis is ordinarily defined in the cosmetology and electrotherapy fields as a method for forcing chemical solutions into the unbroken skin. In those fields, *cataphoresis* uses the positive pole to introduce a positively ionized substance into the skin. *Anaphoresis* employs the negative pole to force a negatively ionized substance into the skin.

In electrology, however, cataphoresis has a specialized meaning. It refers to the use of the positive pole to produce an acid in the skin, thereby counteracting and neutralizing the alkali produced by negative *galvanic* treatment. See Chapter VIII for a more thorough explanation of its advantages and application.

The Phenomenon of Magnetism

More than 2000 years ago the Greeks discovered that a certain kind of rock was able to attract small pieces of iron. Because these objects were found in and around the city of Magnesia they came to be called "magnets." Early sailors and desert travelers used these stones for a compass because one end of the stone (they called it a "lodestone") would always point north when freely suspended. These lodestones were actually chunks

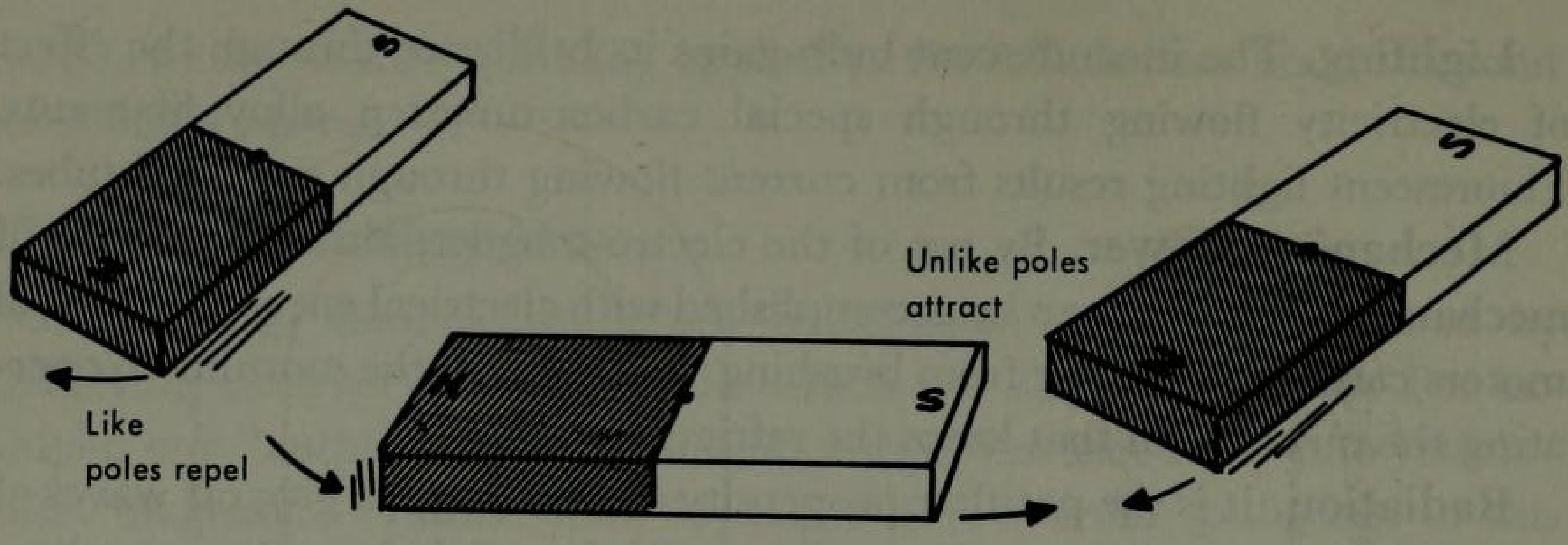


FIGURE 63. *Effects of magnetic polarity.*

of magnetite, which is a substance possessing "natural" magnetism. They pointed north because they were influenced by the earth's own magnetism.

The ability of magnets to influence one another is explained in terms of *magnetic polarity.* All magnets have a positive and a negative pole, so that unlike poles attract each other while like poles repel. The north magnetic pole of the earth attracts the opposite pole of the lodestone or the magnetic compass needle.

Magnets will also affect certain "magnetic" materials such as iron, nickel and cobalt. These materials do not, in their natural state, have any magnetism of their own, but they are easily attracted to the magnetic poles of a magnet. Figure 64 shows how metal objects will be attracted to both ends of the magnet, though not to the middle. This pattern is due to the action of the *magnetic field* around the magnet.

The shape and nature of the magnetic field around a magnet can be observed in an experiment using tiny iron filings. By placing a sheet of some non-magnetic substance, perhaps cardboard or a glass plate, over a magnet and sprinkling its surface with iron filings, you will observe that the filings arrange themselves in definite patterns according to the magnetic polarity.

A magnetic field, then, is *an area of magnetic influence surrounding a magnetically polarized object.* The patterns into which the filings become

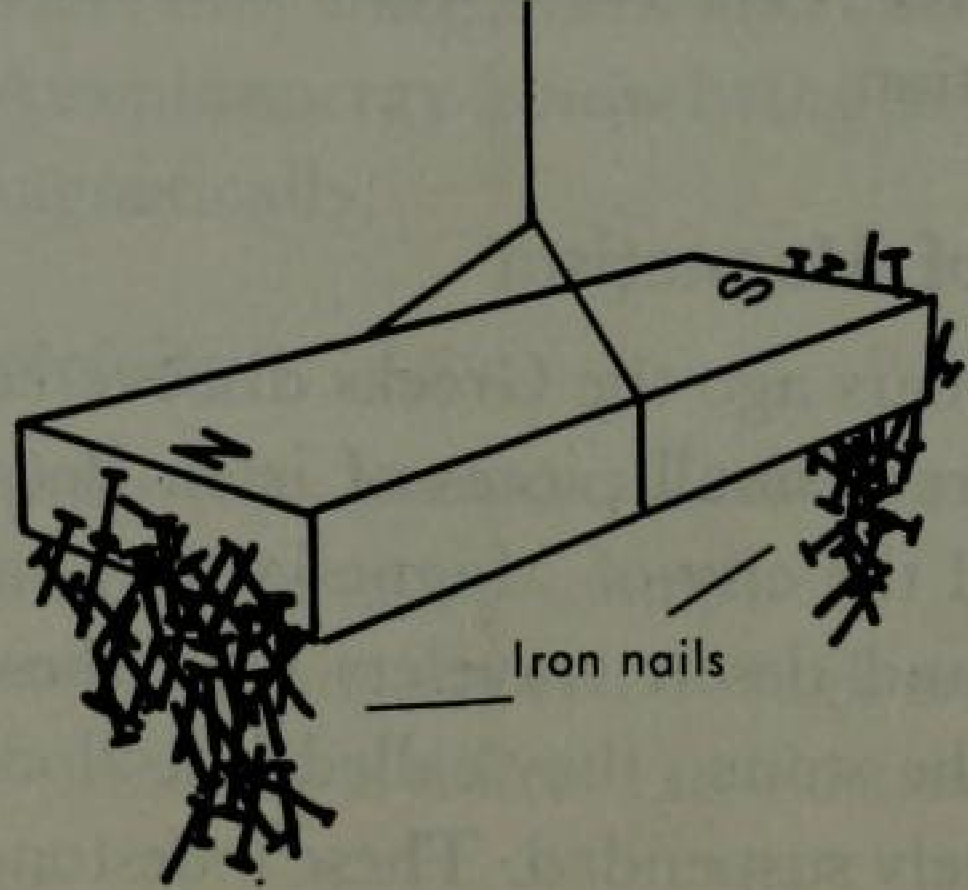


FIGURE 64. *Magnetic attraction.*

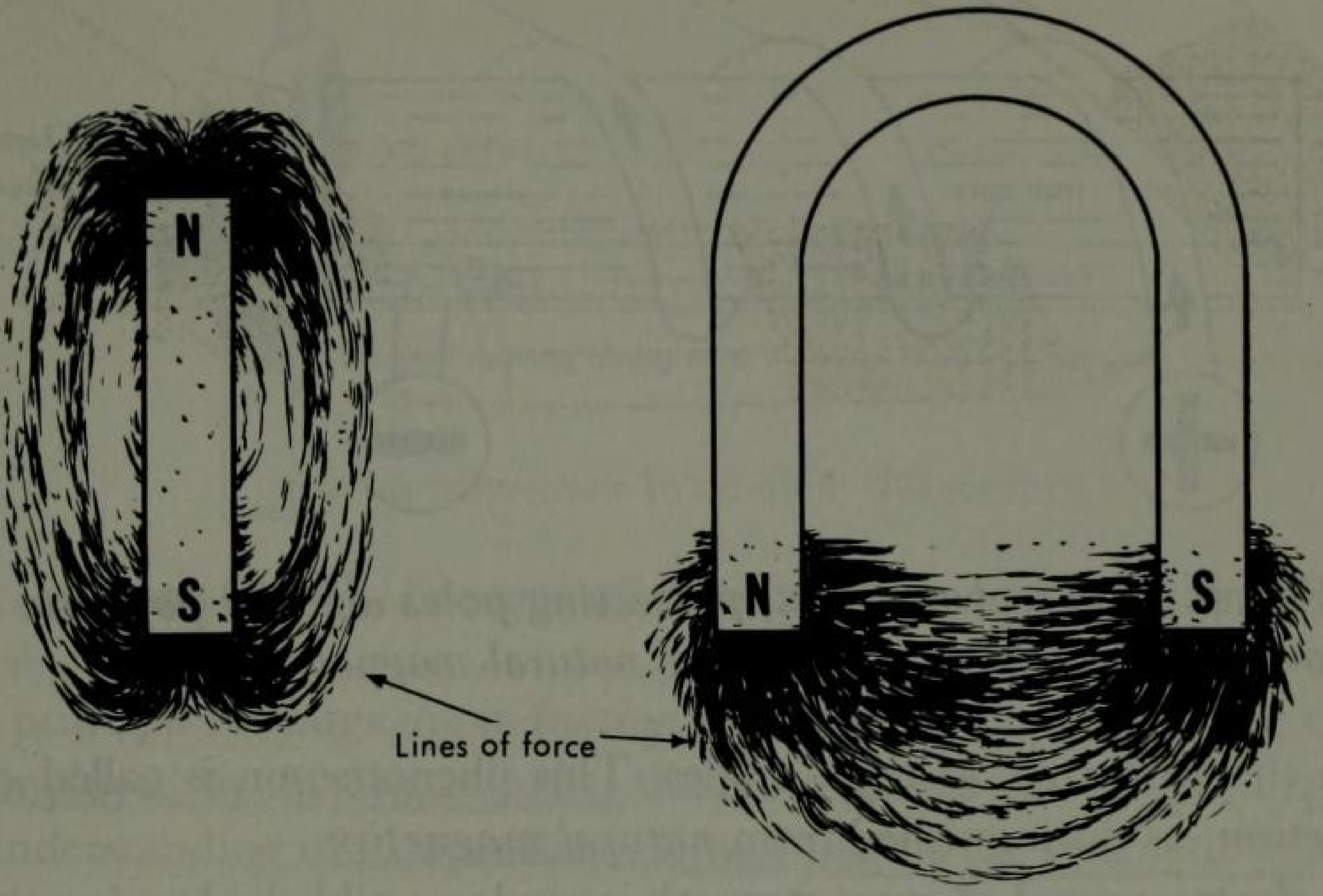


FIGURE 65. *Iron filings being arranged by magnetic fields.*

arranged represent magnetic *lines of force,* which are presumed to exist independently of the filings. In those areas where the *field density* is greatest (i.e., where the most lines of force are concentrated) the attracting or repelling force is strongest.

Electrical Magnetism

In 1819, a Danish physicist named Oersted discovered that whenever current is passed through a wire, a magnetic field develops around it. The lines of force surround a straight wire in concentric rings. This pattern may be observed by sprinkling iron filings on a piece of cardboard, through

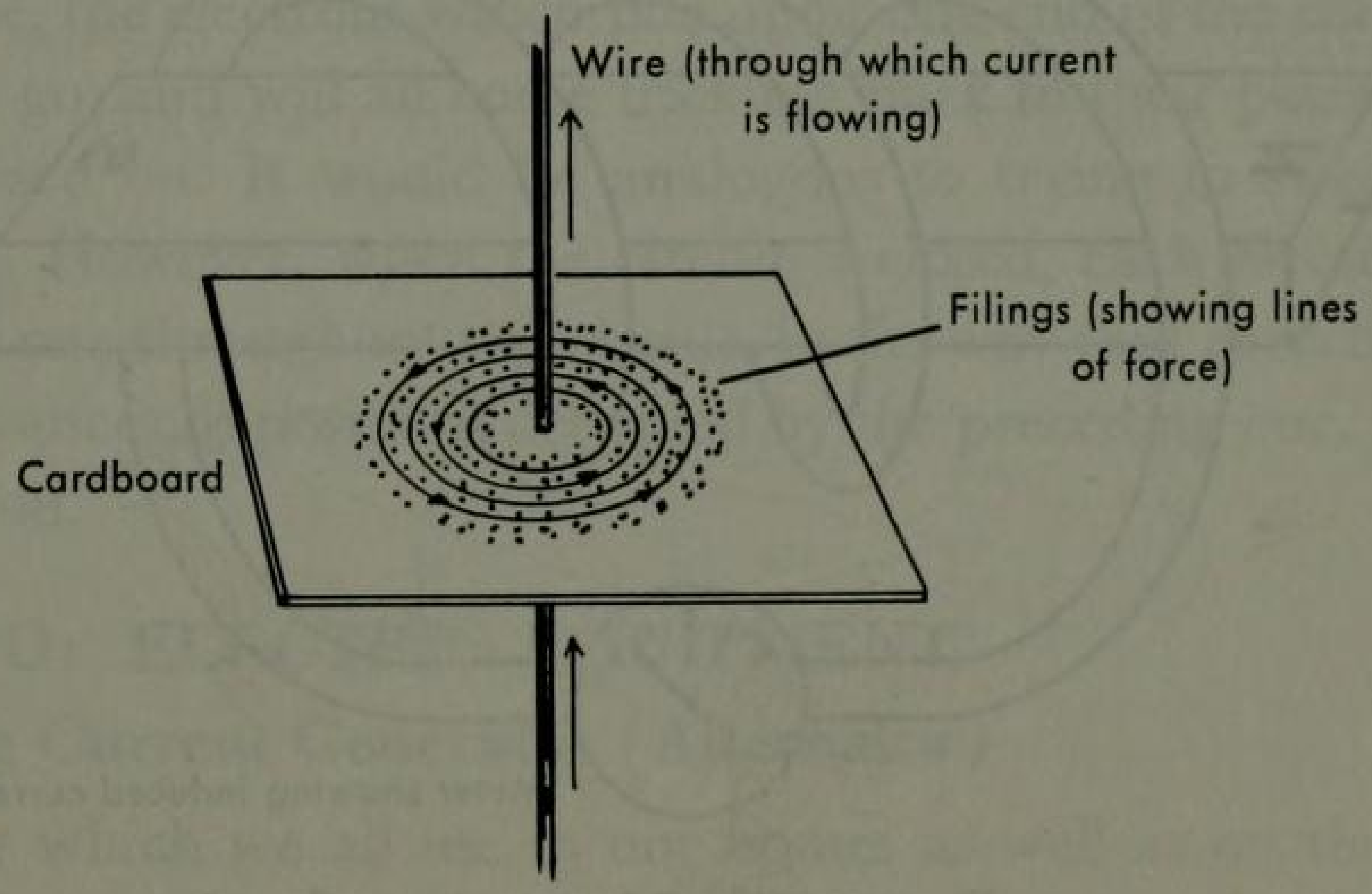

Wire (through which current is flowing)
Filings (showing lines of force)
Cardboard

FIGURE 66. *Demonstration of electrically-induced magnetism.*

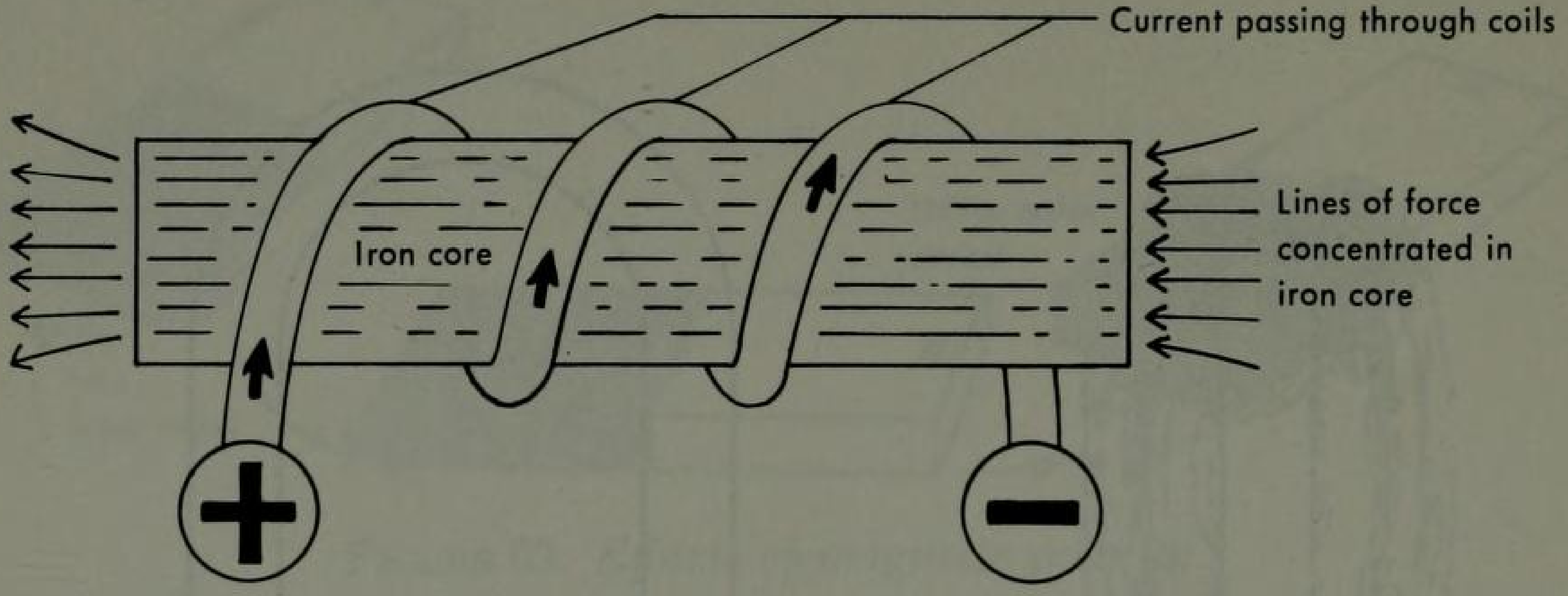

Current passing through coils
Lines of force concentrated in iron core
Iron core
+
−

FIGURE 67. *Electromagnet, possessing poles and the power to attract magnetic materials, as does the natural magnet.*

which the wire runs at right angles. This phenomenon is called *electromagnetism,* as distinguished from *natural magnetism.*

An *electromagnet* of great strength is made possible by looping the electric wire into a coil around an iron core. When current is passed through the wire, the lines of force surrounding each coil are so tightly packed together that they produce a powerful magnetic field in the iron core. The electromagnetic principle has thus made electricity a practical source of power.

Magnetism in Motion Produces Electricity

Michael Faraday, renowned Bristish physicist, reasoned that if electricity could produce magnetism, magnetism could produce electricity. By 1831 he had discovered that a bar magnet would induce an electric current in a coil of wire, if: (1) the magnet was moving inside the coil and (2) the wire formed a closed circuit.

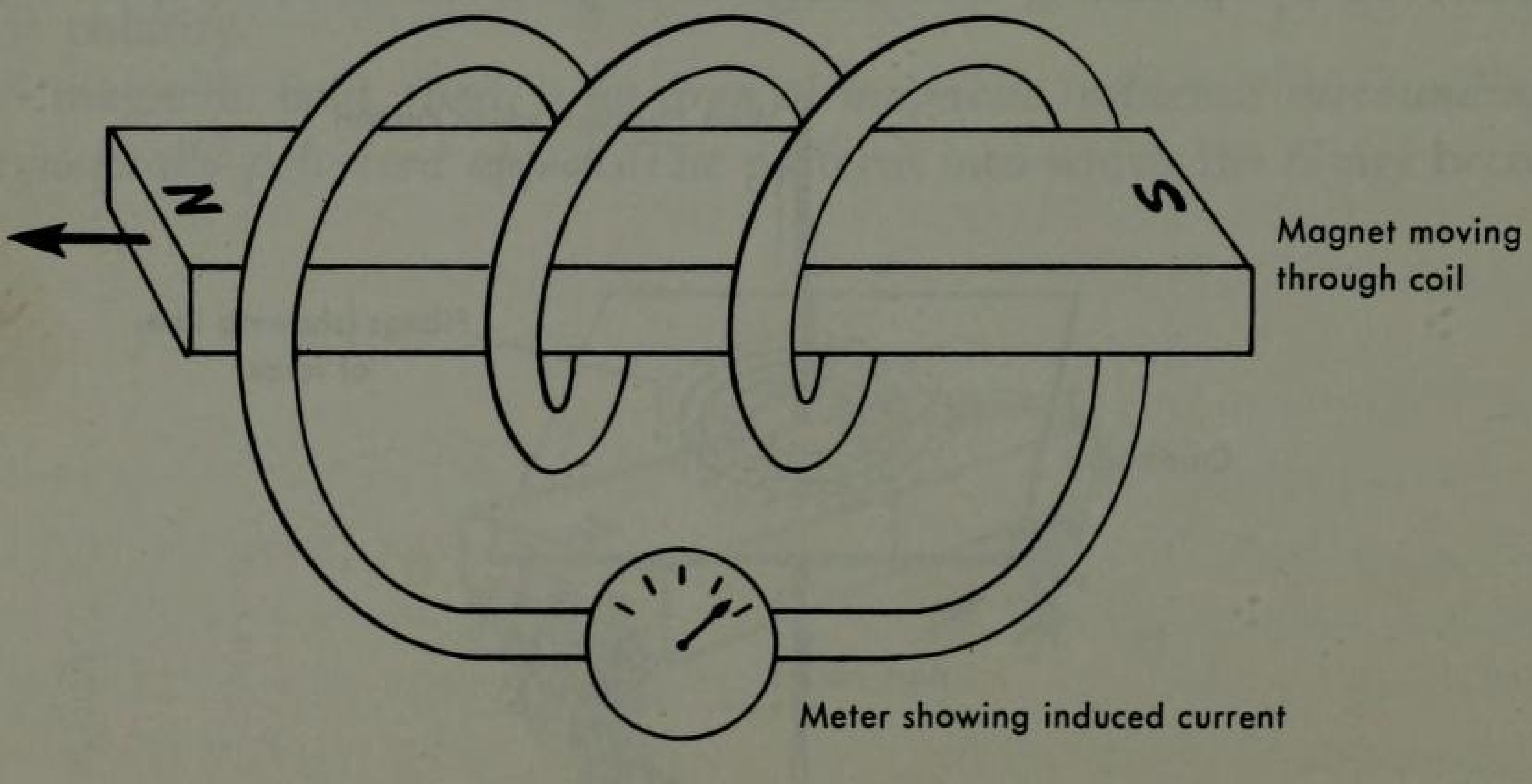


FIGURE 68. *Magnetic induction.*

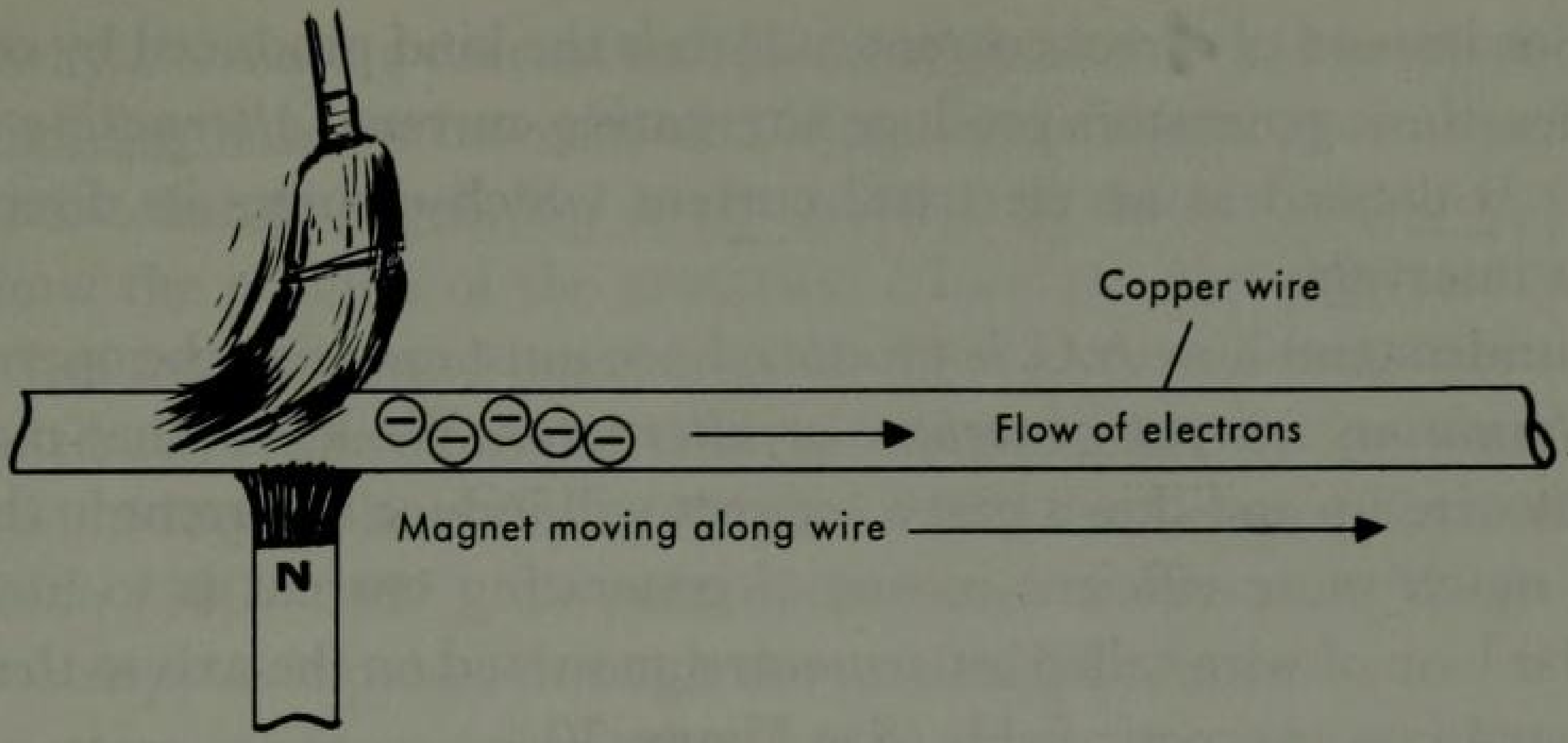


FIGURE 69. *The "sweeping" effect of the magnetic field.*

The principle of *magnetic induction* is an important factor in the equipment employed by the electrologist; therefore the student should acquire a basic understanding of its operation. If we imagine the magnetic field as a kind of magical kitchen broom, one that can reach through walls, floors or any other "solid," it becomes easier to appreciate just what happens. We have already seen that electromagnetic lines of force can exert their influence through cardboard or glass; the fact is that nothing—not even a copper wire with rubber insulation around it— stops the field from sweeping right through it.

Now this magical broom, the magnetic field, has the power to sweep electrons from their orbits without disturbing the other parts of the atom. Standing still, the field is like any other "broom"; it will not sweep a thing. But when it brushes across a wire, *electrons from the copper atoms* are carried along with it. This movement of the electrons is the electric current. The method does not manufacture electrons, it just moves those already present in the wire.

For an actual current to be produced, the conductor must form a closed circuit. Otherwise, the electrons which pile up at one end of the conductor have nowhere to go, and will all come trickling back to their places when the field has passed on. It would be analogous to trying to sweep dust against the wind. However, when the circuit is closed, each electron can displace the next one throughout the circuit, in the way that each link of a bicycle chain advances to positions occupied by the preceding one. That is magnetic induction.

SECTION TWO: ELECTRIC EQUIPMENT

The Alternating Current Generator (Alternator)

The electricity which we all use in our homes as well as on the job is produced by giant generators operating on the principle of magnetic induction. But instead of direct current, which is the kind produced by cells and batteries, these generators produce alternating current. *Alternating current* (A.C.) is defined as an electrical current which changes its direction at regular intervals.

To understand how A.C. is produced, we must examine the operation of the *alternating current generator or alternator.* We know that moving a straight wire up and down past a magnet will induce a current in the wire. But a much more efficient means of generating current is to use a rectangular loop of wire called an *armature*, mounted on the axis so that it can be rotated in a magnetic field. (See Figure 70.)

The figure shows the wire loop rotating between two poles of a "horseshoe" magnet in such a way that it continuously cuts across their magnetic field. This induces current in the wire. In relation to the magnet, the current (electrons) will always flow in one direction, *in* near the north pole and *out* near the south pole. However, in relation to the wire, the current will reverse in direction with each half revolution of the armature.

To envision this let us call one of the wire terminals "blue" and the other "red." The diagram shows the armature in such a position that the current is running from "blue" to "red." But the armature is not standing still; it is turning over. Therefore, when it has turned half-way around, "red" will be where "blue" was and vice versa. The current will then be running from "red" to "blue." And so it continues to reverse as the armature turns, creating an alternating current.

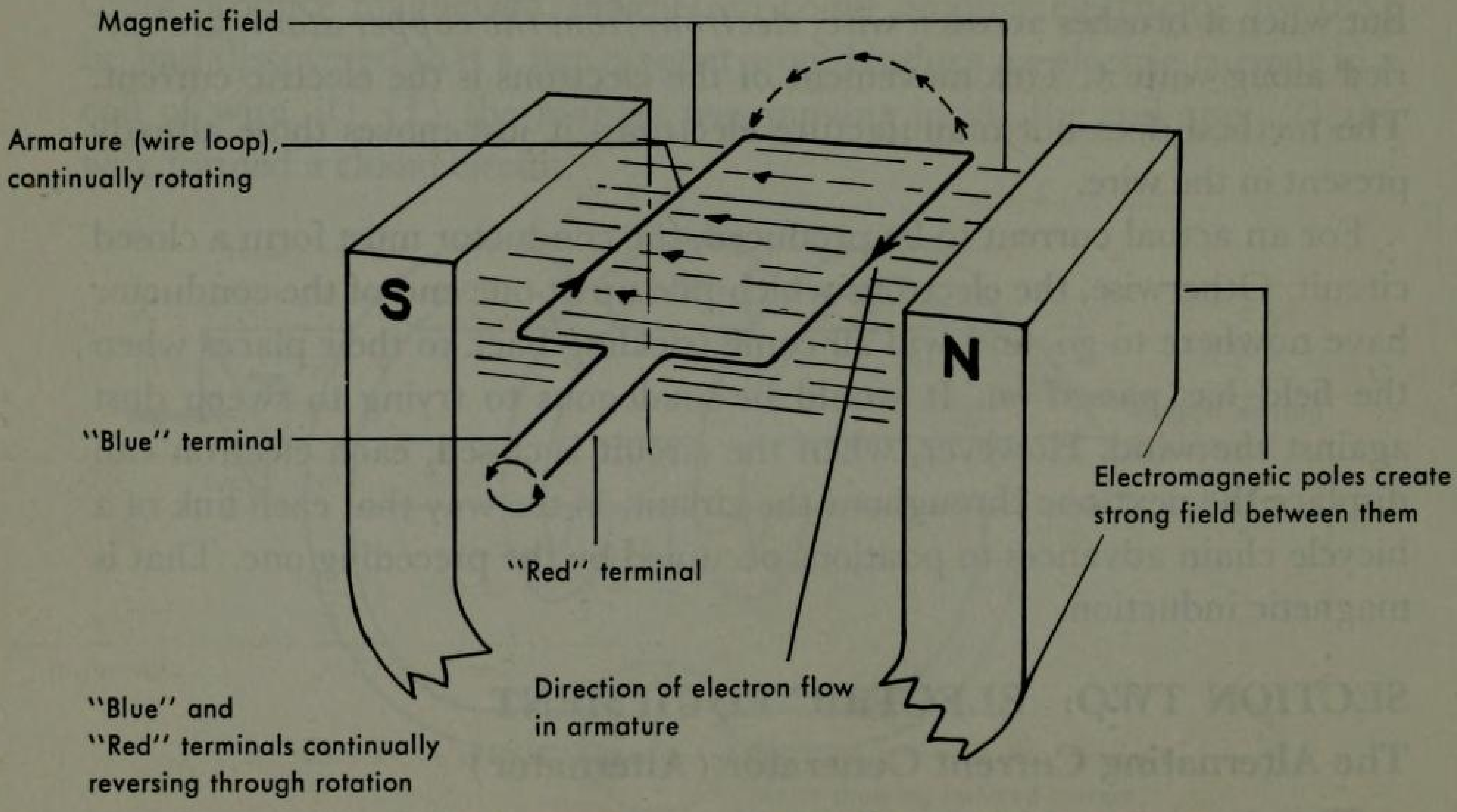

Magnetic field
Armature (wire loop), continually rotating
S
N
"Blue" terminal
"Red" terminal
Electromagnetic poles create strong field between them
Direction of electron flow in armature
"Blue" and "Red" terminals continually reversing through rotation

FIGURE 70. *A simple alternator.*

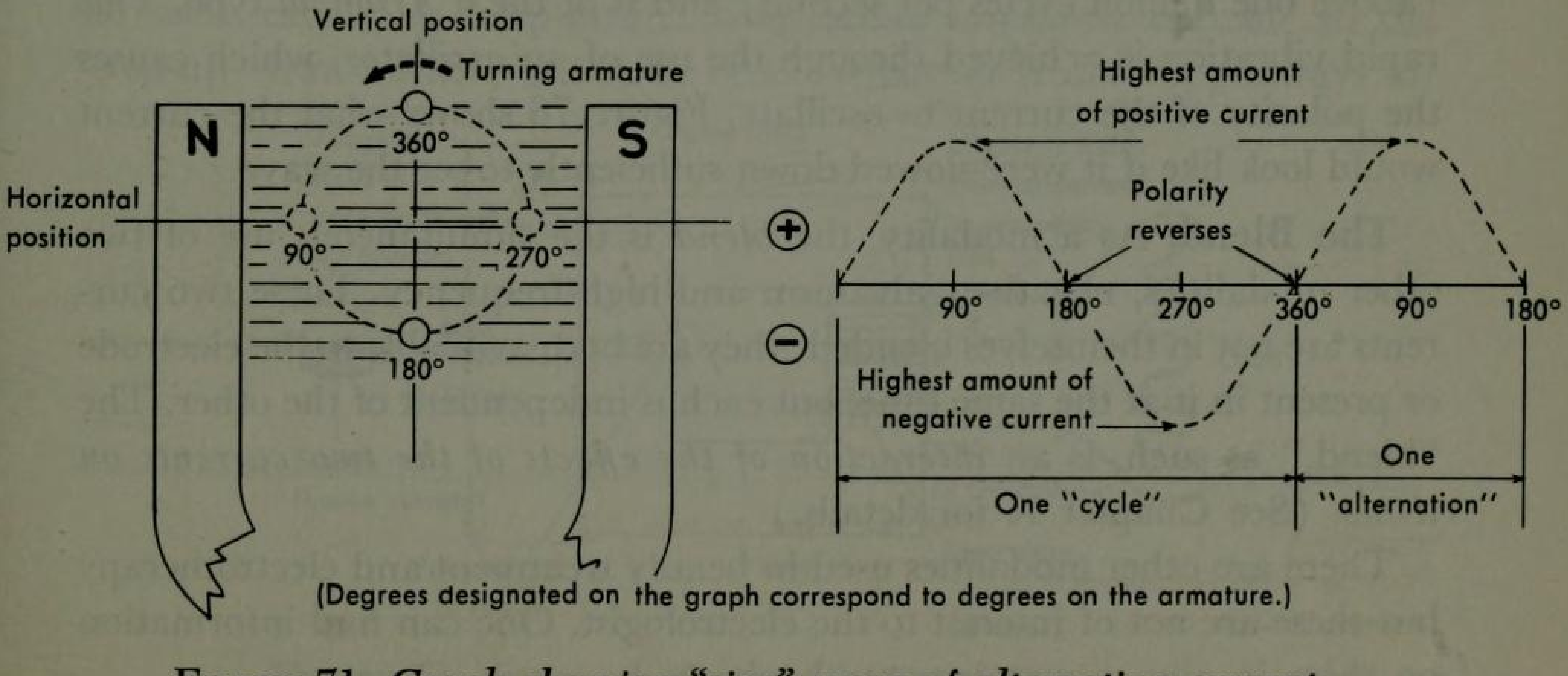
The way alternating current carries through a wire may be plotted on a graph showing how the intensity and the polarity (positive or negative) of the current change in relation to the position of the armature. Figure 71 shows how the position of the armature affects the current. The closer it approaches the horizontal position (90°–270°), the more lines of force it cuts and therefore the more current it produces. Note that the graph shows current at its highest intensity at 90° and 270°. As it approaches the vertical position (180°–360°), the current decreases to zero and changes direction (polarity) as it passes through the vertical position.

The pattern used to represent the change in current amount and polarity is called a *sine* wave. The current is therefore called *sinusoidal.* When we speak about *frequency* of a current we are referring to the number of *full cycles* per second. A "cycle" is, of course, one full rotation of the armature, through 360°, but the term is usually used to designate the change in current that takes place during the rotation. A sixty-cycle alternating current, for example, would be produced by rotating the armature sixty revolutions per second. Each wave is called an *alternation,* and it is from this that the current receives the name "alternating current."

Modalities

A *modality* is the manner or mode in which electricity is used to produce a therapeutic effect. It is not a *kind* of current, but the *way* the current is controlled for a specific purpose. In the field of electrology there are four modalities: positive galvanism, negative galvanism, high-frequency, and superimposed or the "blend."

Positive and Negative Galvanism. Galvanic current is direct current (D.C.), like that produced by a cell or battery, which flows without break



(Degrees designated on the graph correspond to degrees on the armature.)

FIGURE 71. *Graph showing "sine" wave of alternating current.*

or change in intensity. The galvanic current used in electrology is obtained by the use of a *rectifier* which changes the alternating current from the wall outlet into D.C. *Negative galvanism* is, in electrology, the use of the negative pole for the electrolysis method of removing hair. *Positive galvanism* is the use of the positive pole for cataphoresis.

High-Frequency. High-frequency has traditionally been defined as an oscillating current of 10,000 or more cycles per second. It might be well, however, to update our thinking and adopt the presently accepted terminology for oscillating current frequencies as found in Webster's Seventh New Collegiate Dictionary.

> **Radio frequency:** An electromagnetic wave frequency intermediate between audio frequencies and infrared frequencies used especially in radio and television transmission.

INTERNATIONALLY RECOGNIZED RADIO FREQUENCIES

Class	Abbreviation	Range
very low frequency	vlf	10 to 30 kilocycles
low frequency	lf	30 to 300 kilocycles
medium frequency	mf	300 to 3000 kilocycles
high frequency	hf	3 to 30 megacycles
very high frequency	vhf	30 to 300 megacycles
ultrahigh frequency	uhf	300 to 3000 megacycles
superhigh frequency	shf	3000 to 30,000 megacycles
extremely high frequency	ehf	30,000 to 300,000 megacycles

Equipment used in the removal of hair operates in the *megacycle* range (above one million cycles per second) and is of the *d'Arsonval* type. This rapid vibration is achieved through the use of an *oscillator,* which causes the polarity of the current to oscillate. Figure 76 shows what the current would look like if it were slowed down sufficiently to see the wave.

The Blend. As a modality, the *blend* is the simultaneous use of two other modalities, negative galvanism and high-frequency. These two currents are not in themselves blended; they are both available to the electrode or present in it at the same time, but each is independent of the other. The "blend," as such, is an *interaction of the effects of the two currents on tissue.* (See Chapter X for details.)

There are other modalities used in beauty treatment and electrotherapy but these are not of interest to the electrologist. One can find information on these in any cosmetology textbook.

Devices that Alter or Control the Current

In order to achieve a desired modality, certain devices are necessary to alter and control the commercial current delivered to our homes and offices by public utility wires. By these devices the ordinary 110 volt A.C. current can be changed in voltage and amperage or turned into D.C. This direct current can then be "smoothed" and/or made to oscillate at high frequencies. The following are devices utilized in the electrologist's equipment:

Transformer. The transformer is a device for *altering voltage* in alternating current circuits. By employing the principle of magnetic induction (current flow induced magnetically), a transformer is designed either to increase or decrease the pressure of the current flowing through it. The former type is called a "step-up" transformer, the latter a "step-down" transformer.

Figure 72 shows how voltage is "stepped up" in accordance with what is called the "turns ratio." Ordinary house current, which flows with 110 volts, passes through a *primary coil* of wire wound around an iron core. This of course, produces a magnetic field in the iron core. By magnetic induction, the magnetic field induces a second current in the *secondary coil*, which is also wound around the core.

Because there are more windings or "turns" in the secondary coil than in the primary, more force is exerted by the magnetic field on the electrons in the secondary coil wire. Therefore its voltage is greater than that of the primary coil. There is a direct proportion of coil turn to the increase of voltage, this being the *turns ratio*. Since, in the example, the ratio of turns is 1 to 3 (2 vs. 6), the voltage in the secondary coil becomes, proportionately, three times higher than that of the primary coil (110 volts vs. 330 volts). (The amperage, incidentally, reduces as voltage increases, by the same ratio.) A "step-down" transformer is exactly opposite to the "step-up" transformer; the turns ratio (whatever it may be) always in-

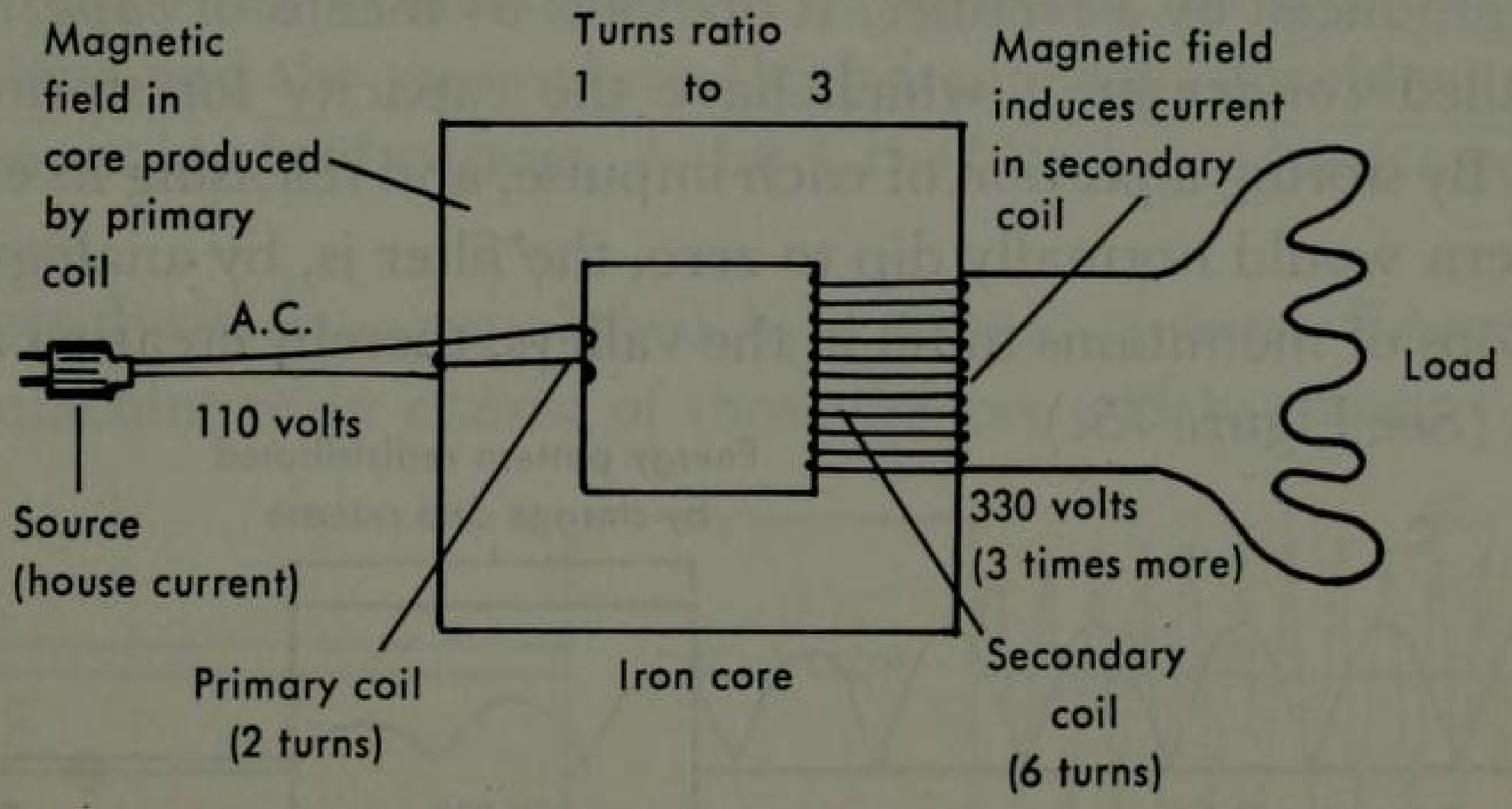


FIGURE 72. *Simple diagram of "step-up" transformer.*

volves a greater number of turns in the primary rather than secondary coil, thus reducing voltage.

Rectifier. A rectifier is a device (either a vacuum tube, transistor or solid state) used for turning an alternating current into direct current, a process called *rectification.* It acts like a water valve which will allow flow in one direction only. A half-wave rectifier simply blocks the passage of all alternations in one of the two directions, thereby passing on a pattern of spaced impulses in the other direction.

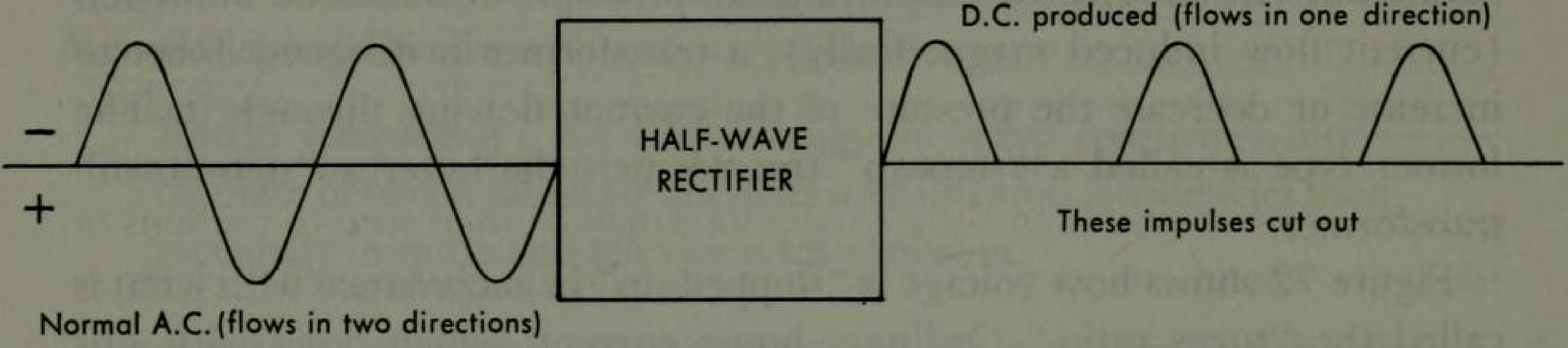

D.C. produced (flows in one direction)
–
+
HALF-WAVE RECTIFIER
These impulses cut out
Normal A.C. (flows in two directions)

FIGURE 73. *Effect of the half-wave rectifier.*

A full-wave rectifier, on the other hand, is circuited in such a way that the reverse alternations or impulses are redirected, so that they flow in the same direction. Electrology equipment employs this latter type of rectifier.

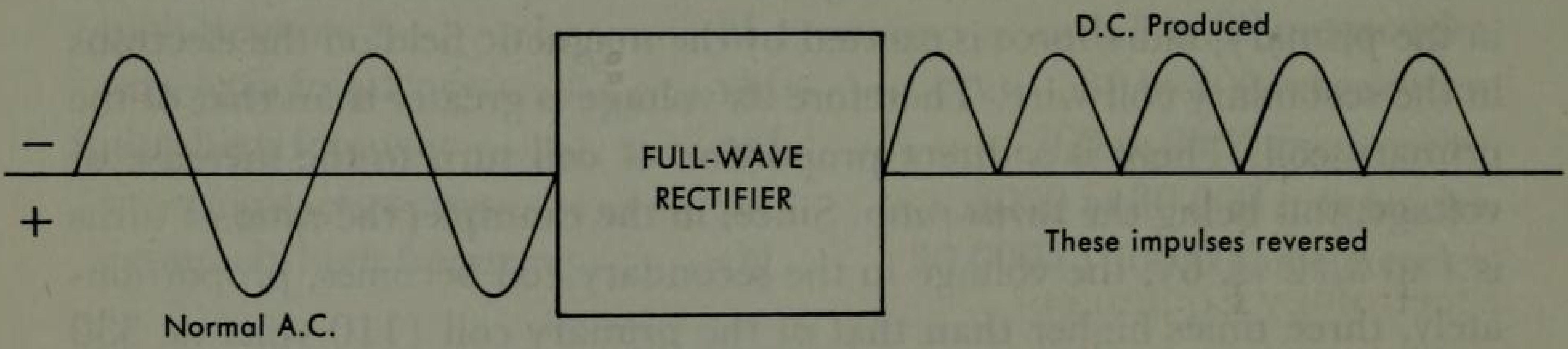


FIGURE 74. *Effect of the full-wave rectifier.*

Filter. A filter is a device which *smooths* the impulse pattern of direct current produced by a rectifier. It operates by means of *capacitors* (sometimes called *condensers*), which have the capacity for storing electrical charges. By storing a portion of each impulse, and releasing its energy when the pattern would normally dip to zero, the filter is, by analogy, chopping off the tops of mountains to fill in the valleys, thereby creating a plateau of current. (See Figure 75.)

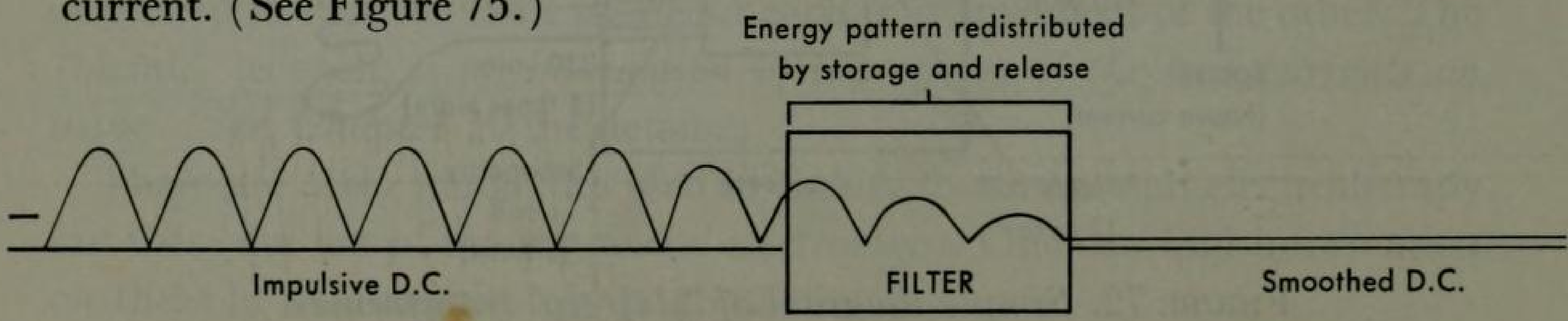


FIGURE 75. *Effects of the filter circuit.*

Oscillator. An oscillator is a device used to produce an *oscillating current.* The thing to remember is that, although alternating current and oscillating current bear a resemblance in pattern to one another, *we call "alternating current" that which is produced by an alternator, "oscillating current" that which is produced by an oscillator.* Generally, oscillations have a higher frequency than do alternations. High-frequency, short wave, diathermy, radio wave and radio frequency are all oscillating currents.

An oscillator utilizes a vacuum tube or transistor to produce oscillations through the interaction of a coil and a condenser. To put the matter simply, the incoming direct current is changed to impulses which bounce through an intricate circuitry from coil to condenser and back, the way echoes bounce back and forth in a cave. The echoes, in this case, are changes in polarity. By circuit design these oscillations may be increased to millions of times per second (megacycles), the range in which high-frequency electrology operates.

Rheostat. A rheostat is a device for controlling the quantity of current flowing through a circuit. It consists of a coil of resistance wire (i.e., wire which does not easily conduct electrons) connected into the circuit. A sliding contact then determines how much current will flow through the circuit by regulating the resistance to its passage.

There are other devices employed in cosmetology and electrotherapy, but the above represent those important to electrology. The "wall plate," for instance, is a special apparatus designed to deliver various kinds of current needed in beauty shops, but is of no use to modern electrology.

Electrology Equipment

With a fair comprehension of the devices listed above, the student should have little trouble understanding the way electrology equipment is put together to produce a desired modality. Generally, three kinds of machines are used to remove superfluous hair. Two of them, the electrolysis (galvanic) machine and the thermolysis (high-frequency) machine, produce entirely different kinds of current. A third, the blend, produces a combination of the two.

(1) **Electrolysis** is accomplished by galvanic current. Therefore an electrolysis machine must consist of those devices which, when connected

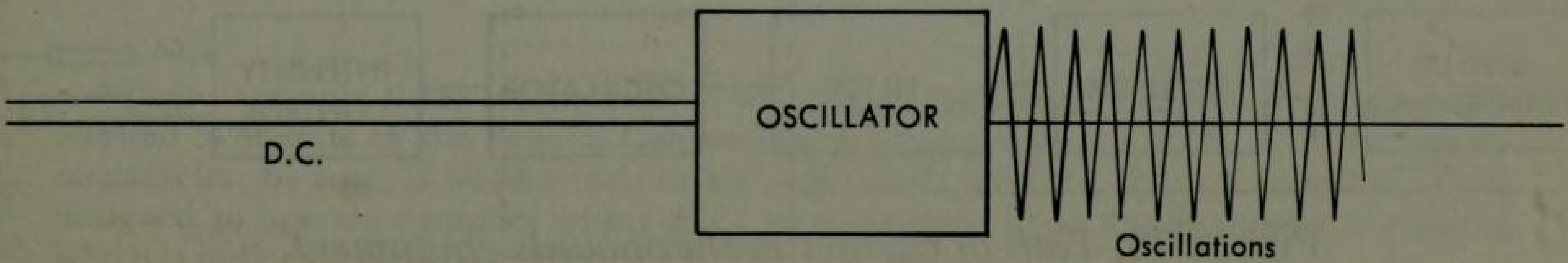


FIGURE 76. *Effect of the high-frequency oscillator.*

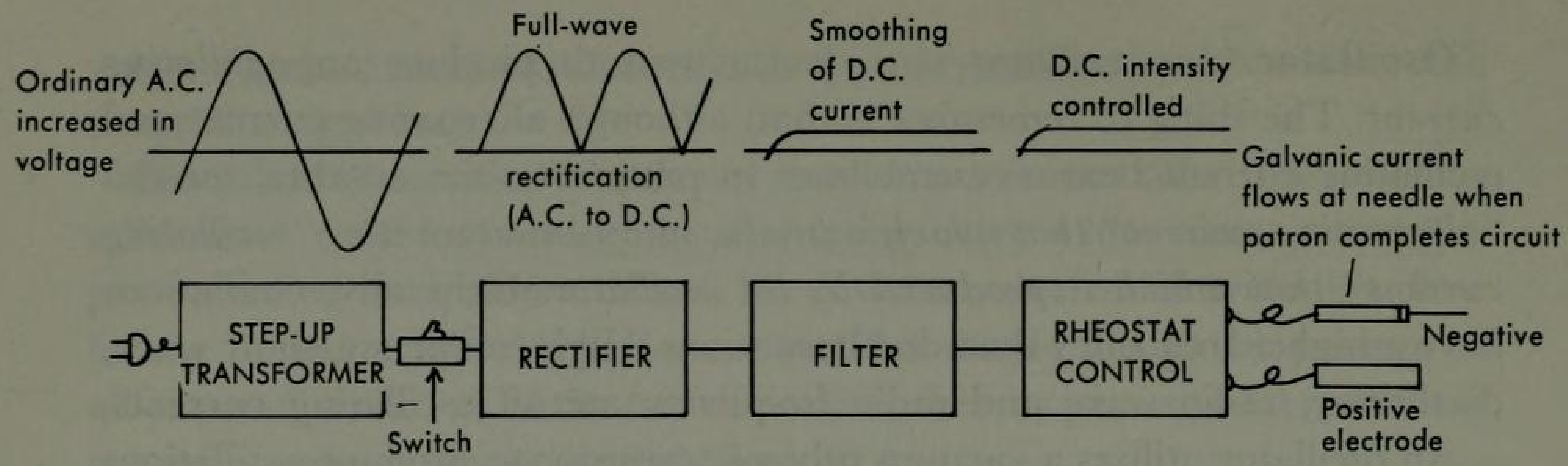

Ordinary A.C. increased in voltage
Full-wave
rectification (A.C. to D.C.)
Smoothing of D.C. current
D.C. intensity controlled
Galvanic current flows at needle when patron completes circuit
STEP-UP TRANSFORMER
Switch
RECTIFIER
FILTER
RHEOSTAT CONTROL
Negative
Positive electrode

FIGURE 77. *Path of current in electrolysis equipment.*

together, will change ordinary 110 volt A.C. house current into a tiny flow of direct current at the needle. Figure 77 shows how several of the devices explained earlier in this chapter are connected in such a way that they produce the desired effect.

First a *step-up transformer* increases the voltage of the incoming A.C. current. Following this a *full-wave rectifier* rectifies the alternations of the current into impulses which all move in one direction. Then a *filter* smooths out these impulses of direct current, to produce a current that flows continuously without change in voltage. Finally a *rheostat* controls the exact amount of current that will pass through the needle, the patron and back through the positive electrode. A *milliamperemeter* tells the electrologist exactly how much current is flowing.

(2) **Thermolysis** is a treatment which is achieved through the heating effects of high-frequency. To create high-frequency current an additional step must be added to the series of steps employed to produce galvanic current. Figure 78 shows how this new step is added.

As in the electrolysis machine, the incoming A.C. current is pushed, pulled, rechanneled and squeezed to produce a smooth direct current of high voltage and low amperage. In addition, however, it enters an *oscillator* which whips the current back and forth until it achieves a frequency

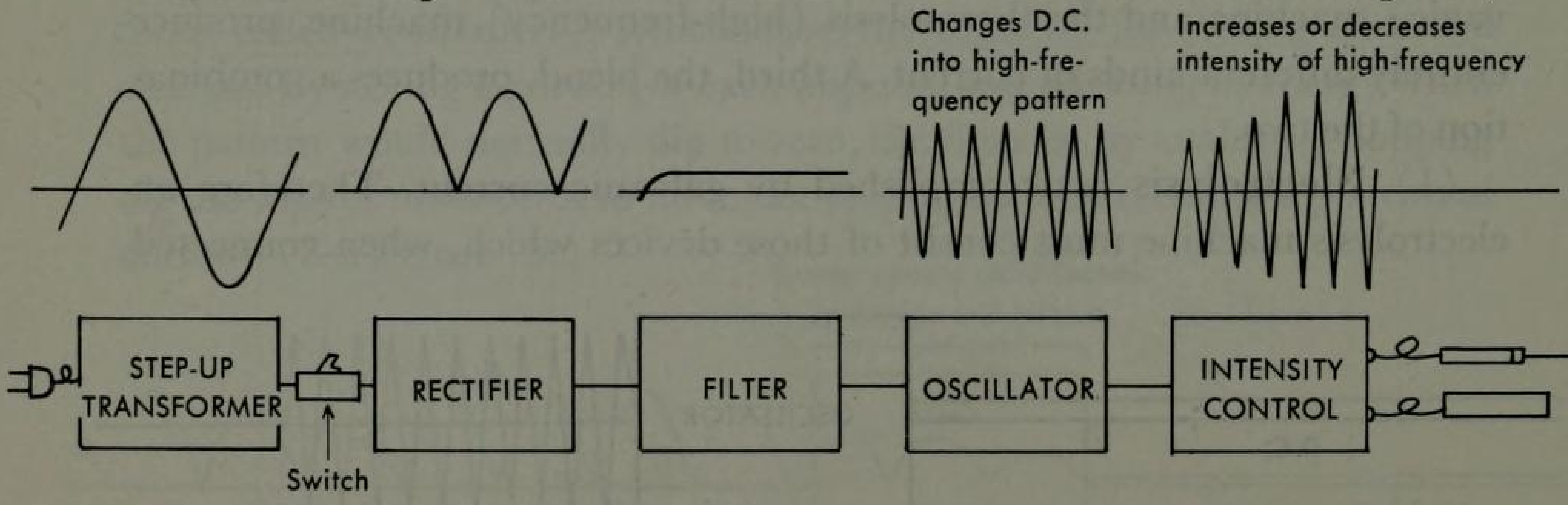

Changes D.C. into high-frequency pattern
Increases or decreases intensity of high-frequency
STEP-UP TRANSFORMER
Switch
RECTIFIER
FILTER
OSCILLATOR
INTENSITY CONTROL

FIGURE 78. *Path of current in thermolysis equipment.*

of millions of cycles per second.* The intensity of this high-frequency current is controlled either by a rheostat or by a variable capacitor.

(3) The **blend** is merely a combination of both electrolysis and thermolysis equipment. Both currents, galvanic and high-frequency, are present at the electrodes. Figure 79 shows the layout of the blend machine.

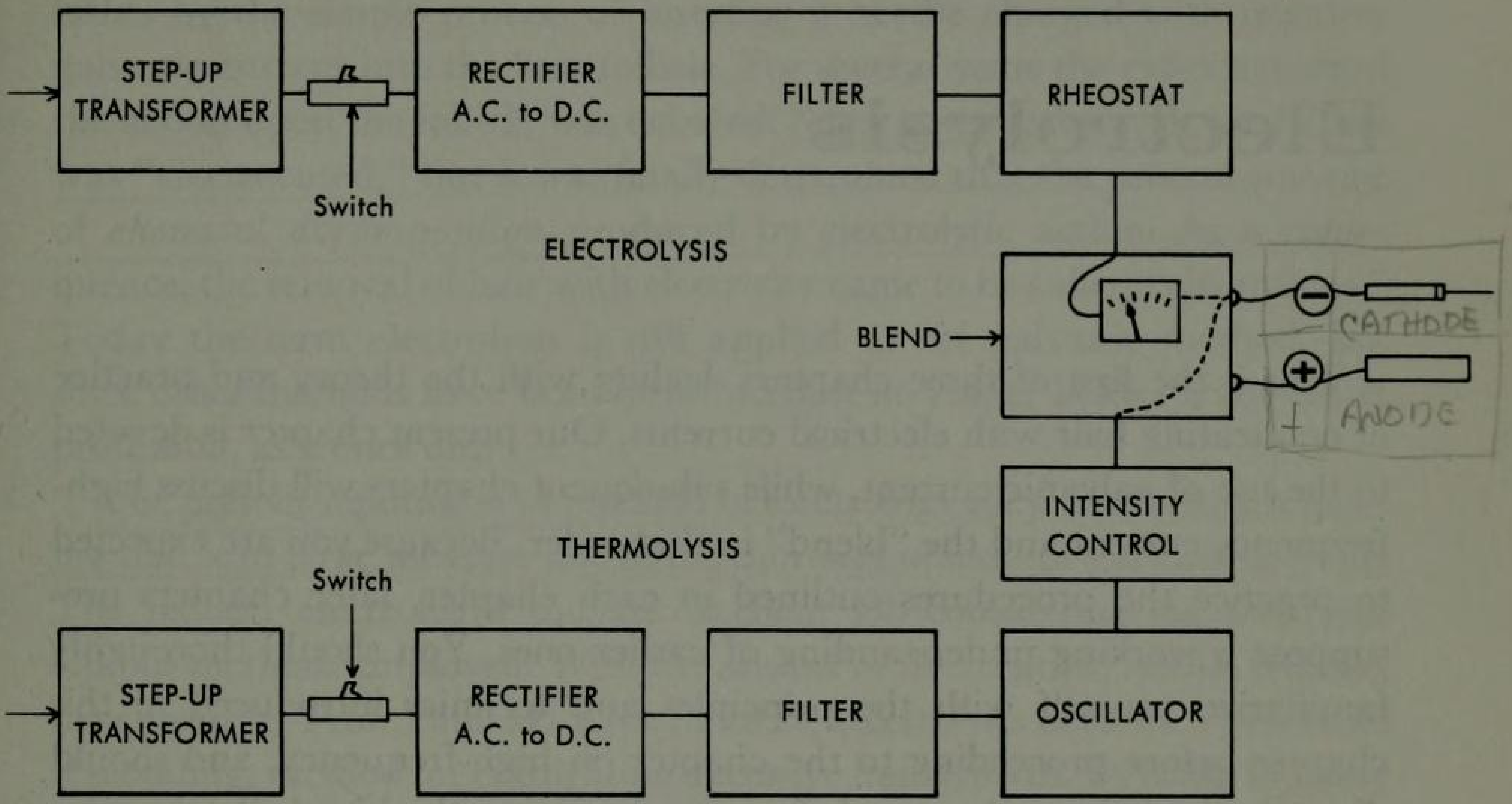


FIGURE 79. *Path of currents in the blend.*

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*There are only three frequencies at which high-frequency electrology equipment is allowed to operate by the Federal Communications Commission: 13.56, 27.12 and 40.68 megacycles. Be sure, if buying used or old equipment, that the frequency at which it is designed to operate complies with F.C.C. requirements. Look for the approval number which is indicated thereon.

Chapter VIII

Electrolysis

This is the first of three chapters dealing with the theory and practice of eradicating hair with electrical currents. Our present chapter is devoted to the use of galvanic current, while subsequent chapters will discuss high-frequency current and the "blend" in that order. Because you are expected to practice the procedures outlined in each chapter, later chapters presuppose a working understanding of earlier ones. You should thoroughly familiarize yourself with the principles and technics introduced in this chapter before proceeding to the chapter on high-frequency, and should digest both of those chapters before proceeding to the blend. By the time you begin reading about high-frequency, you should have acquired many of the basic skills needed to become a practicing electrologist.

History

In the long history of the "art" of beautification, women have seldom gone to greater pains than they have to relieve themselves of excess hair. Well into the nineteenth century women with an excessive hair problem had their choice of any of a number of futile horrors designed by the medical profession to arrest hair growth. One such method was to insert an unsterile needle into the follicle, after the hair had been tweezed, in order to produce an inflammation that would seal up the follicular canal. This, it was believed, would "block" the passage of any new hair growth to the surface of the skin. Another treatment involved the surgical removal of the entire follicle along with the hair. In both cases scarring was a major problem. Applications of sulphuric acid to the skin and hypodermic injections of carbolic acid into the follicle were also attempted, with little success and considerable disfigurement. Perhaps the least injurious and most common treatment of unwanted hair growth was the introduction and rapid twisting of a barbed needle in the follicle. This was, of course, as ineffective as the other methods.

The removal of superfluous hair by the electrolytic action of galvanic current had its beginning in 1875 when Charles E. Michel M.D., of St. Louis, Missouri, reported his findings to the medical profession. Dr. Michel informed his colleagues that he had been able to remove ingrowing eyelashes by the simple process of inserting a needle charged with negative galvanic current into the hair follicle. For several years the exact nature of the action upon the follicle was debated. Some investigators felt the follicle was "electrocuted," but it was finally determined that the process was one of *chemical decomposition* produced by electrolytic action. As a consequence, the removal of hair with electricity came to be called "electrolysis." Today the term electrolysis is still applied to the galvanic method, but since other methods have been introduced, it no longer holds for the entire profession, as it once did.

The present reputation of the field of electrology for *permanently* removing hair is in large measure due to the thoroughness of the galvanic technic. The pioneer electrologist did an excellent job considering the slow and tedious methods employed. With the advent of the multiple needle technic, developed by Prof. Paul M. Kree in 1916, electrolysis became a practical, if plodding, method for eradicating excessive hair growth. By using as many as ten needles simultaneously, the multiple-needle technic somewhat overcame the problem of the one-to-three-minute wait to treat each follicle. Yet, compared to the high-frequency method, discovered years later, this method is very slow. The advantage of galvanic current over high-frequency lies solely in its effectiveness as a means of permanently eliminating hair.

Theory of Galvanic Action

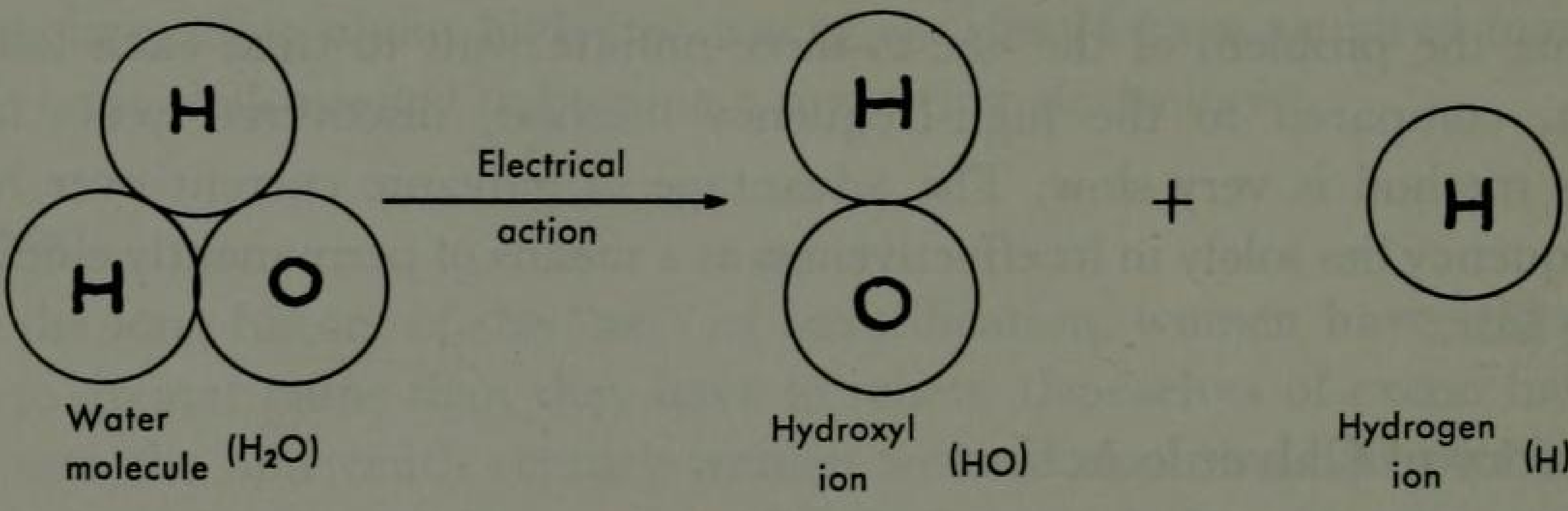
It has long been known that the application of direct electrical current to a solution of salt water produces an unusual reaction. The electrical current causes the *salt* and the *water* to break into their constituent chemical elements, which quickly rearrange themselves to form entirely new substances. The process is called *electrolysis.* The new substances that are formed are *sodium hydroxide (lye), hydrogen gas* and *chlorine gas.* The gases are of little concern to the electrologist, but the lye, being highly caustic, is an effective instrument of destruction when produced in the tiny hair follicle.

Galvanic treatment is basically a chemical process. There is no "cooking," no "electrocution" of the tissue with the galvanic method as some doctors had originally believed. When a needle is introduced into the hair follicle and the current is applied, the body salts combined with the moisture in tissue, which comprise a kind of salt solution, are converted into lye. It is the lye which attacks the tissue, not the current. How this lye is created is best explained in chemical terms.

As mentioned in Chapter VII, all matter is constructed of tiny building blocks called molecules which are in turn composed of atoms. In water each molecule is composed of two atoms of hydrogen and one atom of oxygen (which is why the chemical formula is H_2O). Under the influence of galvanic current, these atoms split apart (ionize) into a hydroxyl ion (OH) and a hydrogen ion (H). Ions are unstable and tend to recombine with other ions.

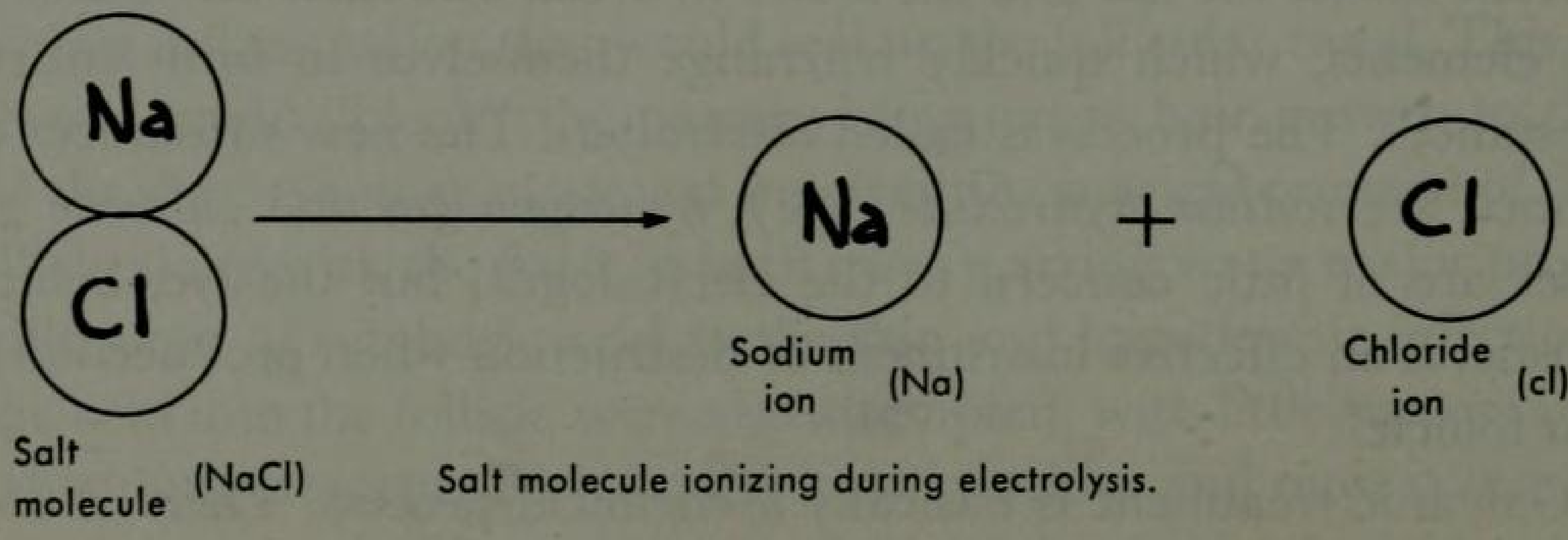
At the same time that water molecules are breaking down, so also are salt molecules (Fig. 80). A salt molecule (NaC) is composed of one sodium atom (Na) and one chloride atom (C), and during electrolysis it simply separates into a sodium ion and a chloride ion.

All of the ions produced during electrolysis tend to reunite immediately. Thus we find chloride ions hooking up in stable pairs (Cl_2) to form chlorine gas molecules. Likewise the hydrogen ions pair off to form hydrogen gas (H_2). Most important, each sodium ion (Na) tends to combine with a hydroxyl ion (OH) to form sodium hydroxide (NaOH). This is our deadly lye. Figure 81 shows how the ions from two molecules of water and



H = hydrogen atom O = oxygen atom

Water molecule ionizing during electrolysis.



Salt molecule ionizing during electrolysis.

FIGURE 80. *Ionization of salt and water during electrolysis.*

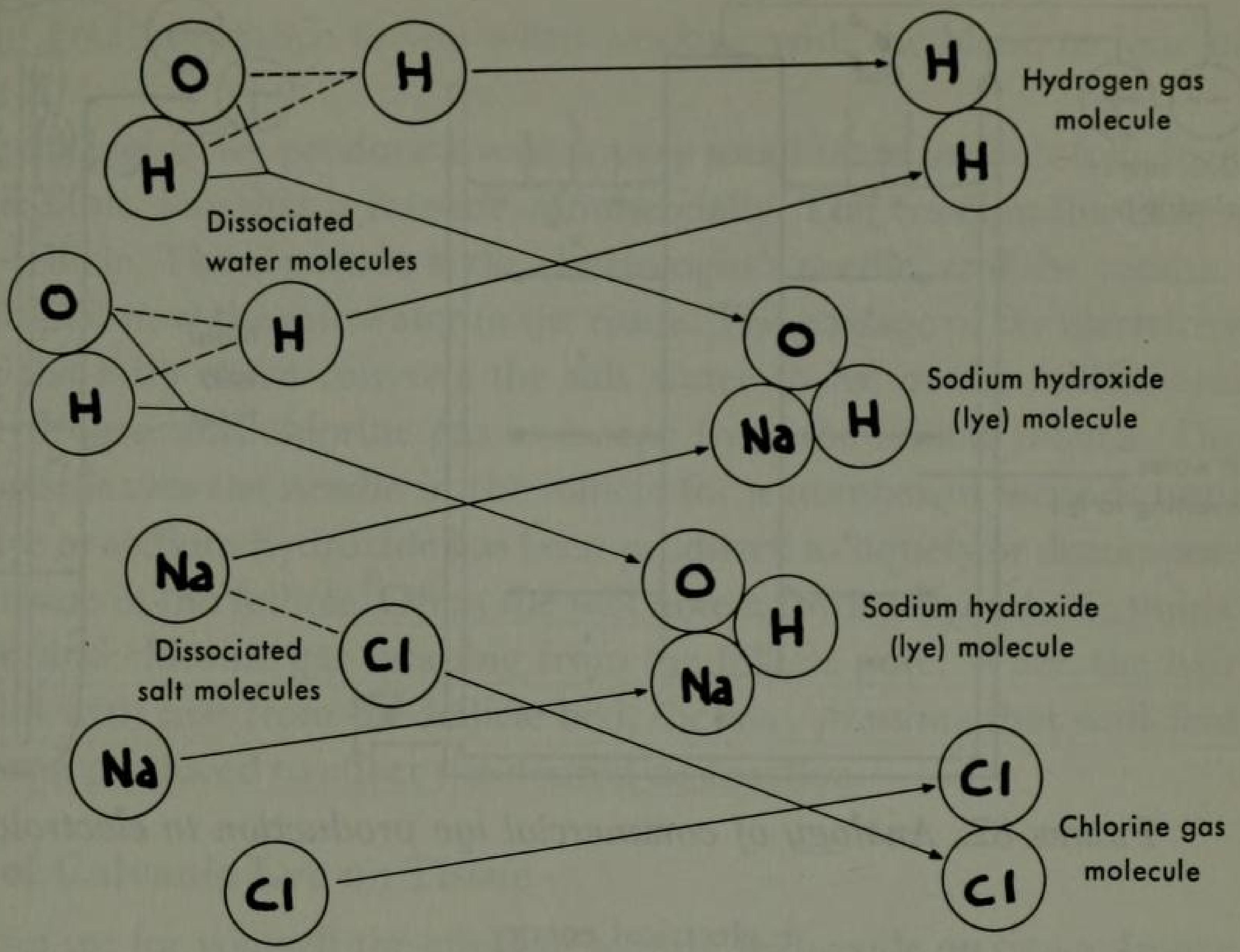


FIGURE 81. *Regrouping of ions during electrolysis.*

two molecules of salt would recombine to produce these new substances. *To put the matter simply, during electrolysis two molecules of water and two molecules of salt will be rearranged into one molecule of hydrogen gas, one molecule of chlorine gas and two molecules of lye.*

The Commercial Production of Lye

The manner in which lye is commercially produced provides an instructive illustration of the process which goes on in the follicle during an electrolysis treatment. It is especially helpful in making it clear how the rate of lye production is directly related to the amount of current being used.

The lye we purchase at the grocery store is no different from that produced by the electrologist in the follicle, except that the former is produced on a much grander scale. Commercial lye is produced in large metal vessels filled with a solution of salt water. The vessel is connected to a source of electricity in such a way that it becomes one pole of the direct current while a large carbon electrode suspended in the center becomes the other pole. The electrons flow from the carbon electrode through the salt water and into the metal vessel to complete a circuit.

The passage of electricity through the salt water causes the chemical action of electrolysis to take place, producing sodium hydroxide (lye), hydrogen gas and chlorine gas.

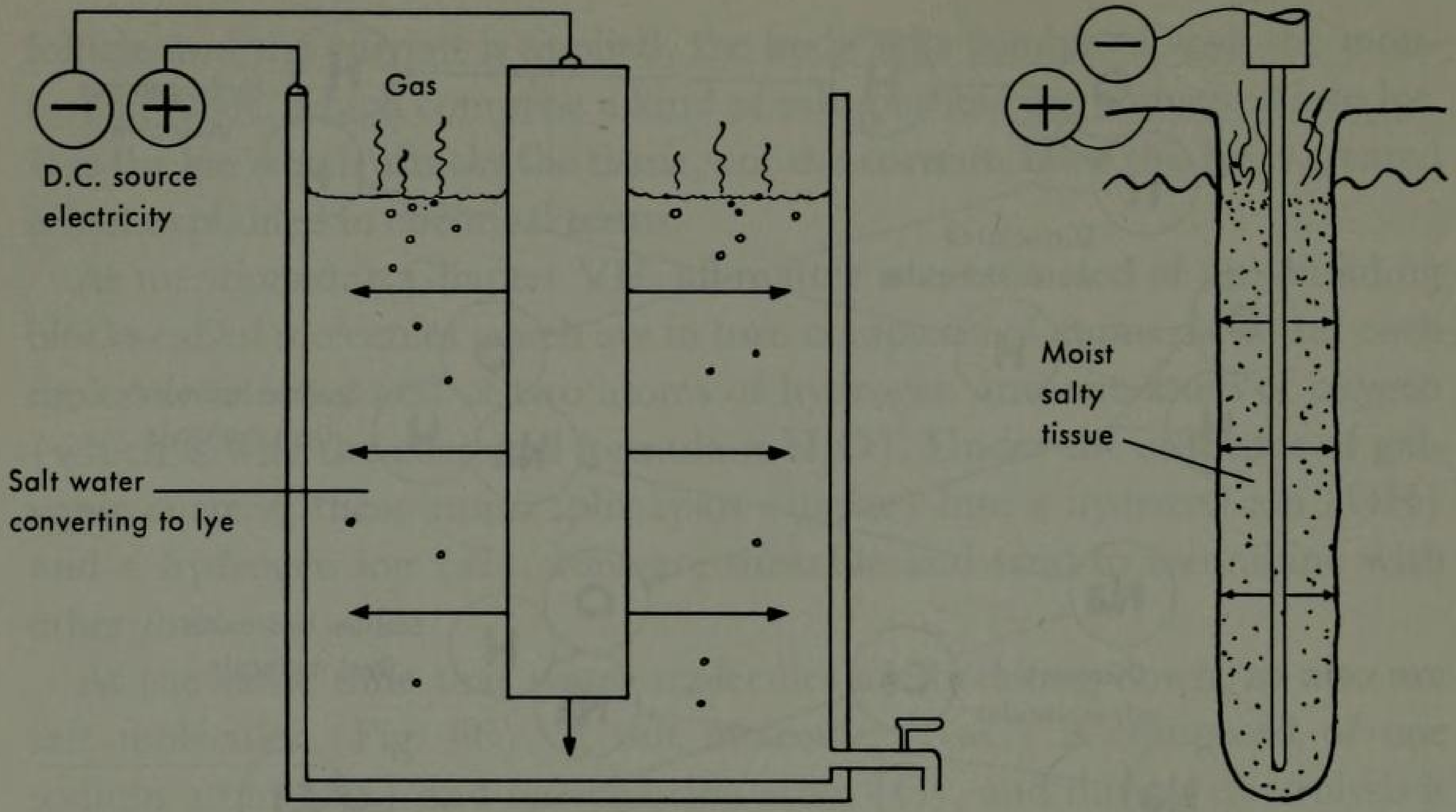


FIGURE 82. *Analogy of commercial lye production to electrology.*

$$\underset{\substack{\text{sodium choride}\\ \text{(salt)}}}{2\,\mathrm{NaCl}} + \underset{\text{water}}{2\,\mathrm{HOH}} \xrightarrow{+\text{ electrical energy}} \underset{\substack{\text{hydrogen}\\ \text{gas}}}{\mathrm{H_2}\uparrow} + \underset{\substack{\text{chlorine}\\ \text{gas}}}{\mathrm{Cl_2}\uparrow} + \underset{\substack{\text{sodium hydroxide}\\ \text{(``lye'' or}\\ \text{``caustic soda'')}}}{2\,\mathrm{NaOH}}$$

In the commercial process the electricity must flow through the vats for many hours at a very high current in order to convert the salt solution into lye. The lye solution is drained off to evaporating pans and there, by a two stage evaporating process, residual salt and water is removed, leaving the lye crystals that we buy at the store.

The lesson to be gained from commercial lye production is the fact that the production of lye is not instantaneous. It follows a mathematical law called Faraday's law, which (adjusted to our field) says that the amount of sodium hydroxide produced by electrolysis is the product of current used times the length of time the current flows *(current × time = amount of lye)*. The longer the time and the greater the intensity of the current, the greater will be the amount of lye produced.

Using a liquid measure, the formula for a commercial-size reaction might look something like this: 10 amperes × 1 hour = one gallon of lye. From this it would follow that any increase in either amperes or hours will increase the amount of lye proportionately. Fifty amperes for one hour, for instance, would create five gallons of lye (50 amperes × 1 hour = 5 gallons), as would one ampere for fifty hours (1 ampere × 50 hours = 5 gallons). The simple equation, current × time = amount of lye, is not of immediate use in the theory and practice of galvanic treatment, but it will be of great assistance to you when working with the blend technic in Chapter X.

As electrologists we produce lye on a very small scale in each follicle in much the same way that it is made commercially. The vessel in this case is the hair follicle. The electrode is the electrologist's needle, and the conductive solution is now the salt water in the tissue. The passage of the electricity through the salty tissue converts the salt water to lye in the follicle and causes hydrogen and chlorine gas to escape from the follicle mouth. The electrologist leaves the needle in the follicle for a number of seconds until enough lye or sodium hydroxide has been produced to liquefy or decompose all vital tissue in the follicle. Often she will note a froth of lymphatic fluids, hydrogen and chlorine gas escaping from the follicle pore. When the hair can be slid with ease from the follicle bed, she may *presume* that sufficient lye has been produced to effect the desired destruction.

Effects of Galvanic Lye on Tissue

You can see for yourself the effect of sodium hydroxide on tissue. In one simple experiment, you have only to place a grain or crystal of lye on a fresh piece of meat. In a few minutes the crystal will be gone, and in its place you will find a small puddle of juice within a cavity formed on the surface of the meat. That is decomposed tissue, liquefied by the caustic action of the lye. (A portion of the liquid is water absorbed from the air by the lye.)

In another experiment, which is outlined in detail later in this chapter, you will be able to see the direct effect of the galvanic current when the needle electrode is placed flat on the surface of a piece of meat with the current on high. Almost immediately you will see bubbles forming in the meat at those points where the needle comes in contact with it. These are escaping hydrogen and chlorine gases formed by electrolytic action. They are not doing the meat any harm. At the same time, you can see the meat is reddening and becoming moist where the needle touches it. This is where lye has been formed and is beginning to decompose adjacent tissue. In short order the lye will eat out a neat little groove in the vicinity of the needle. This is the kind of destruction the needle is intended to do down in the lower portion of the follicle, though not quite so severely.

Effects of Galvanic Lye on the Follicle

Fortunately, the structure of our skin is such that the follicle is not affected in quite the same way as the meat in our experiment. The current may be available along the entire length of the needle, but it affects tissue only where it encounters moisture. In this regard the skin has a natural advantage—the *moisture gradient.* As mentioned briefly in Chapter II, the structure of the skin is such that only the deeper layers of the epidermis have much moisture content, the amount of moisture decreasing gradually as the epithelium cells approach the surface. This moisture gradient makes it possible to concentrate the largest amount of galvanic action at the moist lower follicle, where it belongs. The needle, as an electrode, makes its greatest contact with the moisture in the tissue between the hair root and the follicle wall. The area around the pore of the follicle, which should not be treated, is affected only in proportion to the amount of moisture it contains, and it is usually dry.

The moisture gradient of the skin varies from person to person, but in all people there is some difference in moisture content between tissue at the base of the follicle and the dryer tissue at the surface of the skin. A straight wire needle will conduct current to the surrounding tissue in a pattern determined by the moisture gradient of the tissue it contacts. Thus, no matter how moist a patron's skin, there will always be more lye produced at the lower end of the follicle than at the upper part.

People with dry skins obviously pose the least problems for galvanic treatment. On the other hand, a skin area with a very moist epidermis will undergo a certain amount of lye action at the surface in addition to that at the bottom of the follicle, and it is in these areas that skin reactions can occur. The problem of treating soft, moist skins with deep, coarse hair requires that the electrologist take special pains to introduce no more current into the follicle than is absolutely essential, by periodically testing the hair to determine whether it has come loose.

In addition to the moisture gradient, there is a second biological factor of advantage to the electrologist. From the point where the sebaceous gland ducts enter the hair canal to the place where the follicle reaches the surface, the follicle wall is coated with sebum, which is being continuously excreted by the sebaceous glands. Sebum is an excellent insulator–you can see this yourself by coating a needle with the substance and introducing the needle into a grounded dish of water. The milliammeter will register little, if any,

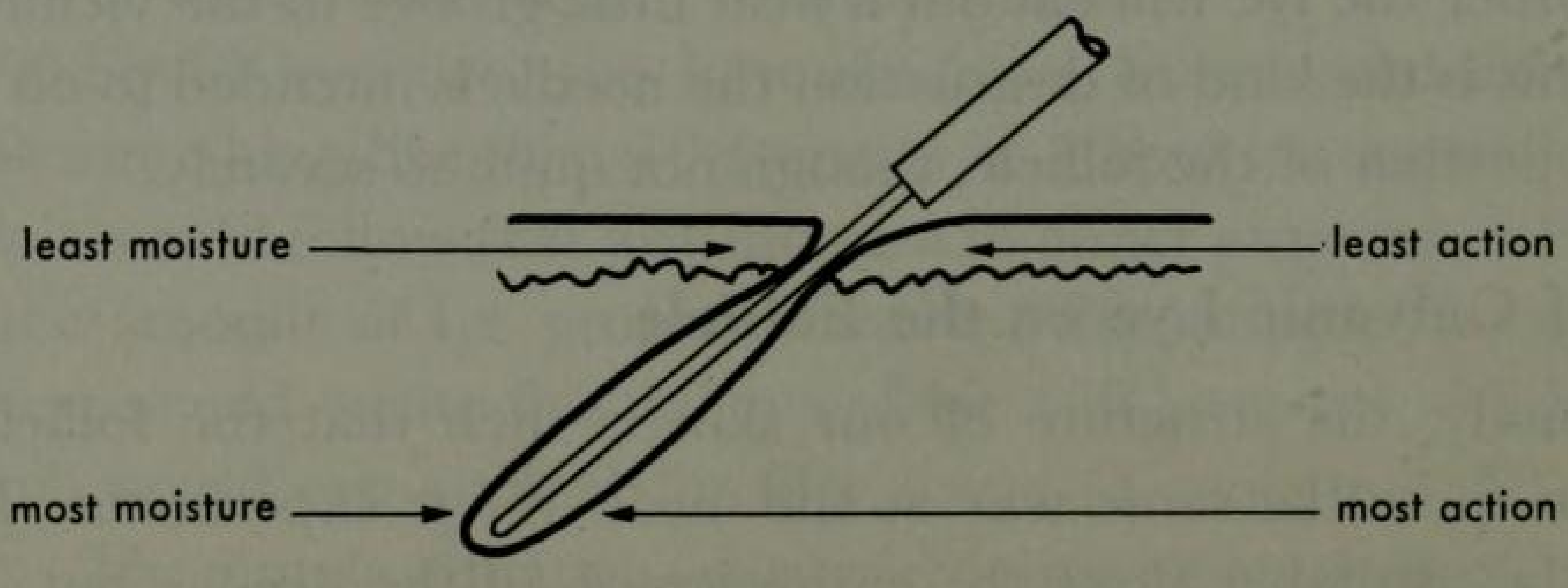


FIGURE 83. *Effect of moisture gradient on galvanic action.*

current flow because of the sebum's insulating qualities. In the follicle, the sebum at the upper part tends to protect the epidermis in the same manner. Patrons with a very oily skin, if they do not have very moist skins as well, are usually easy to treat because of this factor.

Although the follicle may be thought of as a kind of miniature vessel in which lye is produced, we must keep in mind that the physical characteristics of the follicle are far different from those of a commercial lye vessel. Lye is not really "filling" the follicle; it is working its way into the tissue as it does in the meat experiment. Nor is lye, as we have seen, produced uniformly throughout the follicle; most of it occurs in the lower portion. Only during a prolonged application will the lye work its way to the surface, if the follicle has a normal moisture gradient. As a result, when electrolysis equipment is used correctly, the vital parts of the follicle can be destroyed without causing any damage to the epidermis.

Effects of Needle Depth and Current Intensity

The student should observe that the milliammeter will vary in its reading as the depth of insertion varies. The meter will read higher as the insertion becomes deeper. These variations occur because the intensity of galvanic current, as measured in milliamperes, is directly related to the amount of moisture with which the needle is in contact. The deeper the insertion, the greater the flow of current into the follicle, because greater depth involves greater moisture contact. In working with the galvanic single needle method, you will quickly discover that a shallow insertion is sometimes insufficient to pass any current at all, whereas a deeper insertion at the same rheostat setting may register well up on the milliammeter.

The moisture factor insures that there is little or no danger from an inadvertent shallow insertion when using galvanic current. This works to the electrologist's advantage by raising or lowering the current automatically. (This is not true, however, of high-frequency current, which is *more intense* at shallower depths.)

During a multiple needle treatment the various needles should all be of the same length and diameter and should be inserted in skin areas of like moisture content if uniform action is to be achieved. Inconsistent needle depths will prevent the current from dividing equally amongst the several needles. This would prevent the hairs from releasing in the order that the needles were inserted, some being treated faster than others.

Electrolysis Equipment

In the chapter on Electricity it was mentioned that Galvanic Current and Direct Current are the same, being produced by either wet cells or dry cells. The medical profession preferred to use the term Galvanic in honor of Luigi Galvani. Since early electrologists and cosmetologists followed the technical language of the medical profession, the term has persisted. Equipment now in use has eliminated the batteries used in early equipment and utilizes instead a rectified and filtered A.C. current which, when properly designed, produces an excellent Galvanic or D.C. current (as outlined in Chapter VII).

Regardless of current source a simple electrolysis machine should include at least four basic parts: (1) source of D.C., (2) controlling device, such as a rheostat, (3) current intensity indicator (milliamperemeter), (4) two electrodes: the needle holder (negative electrode) and a wet sponge or water jar (positive electrode) connected to the machine by conducting cords.

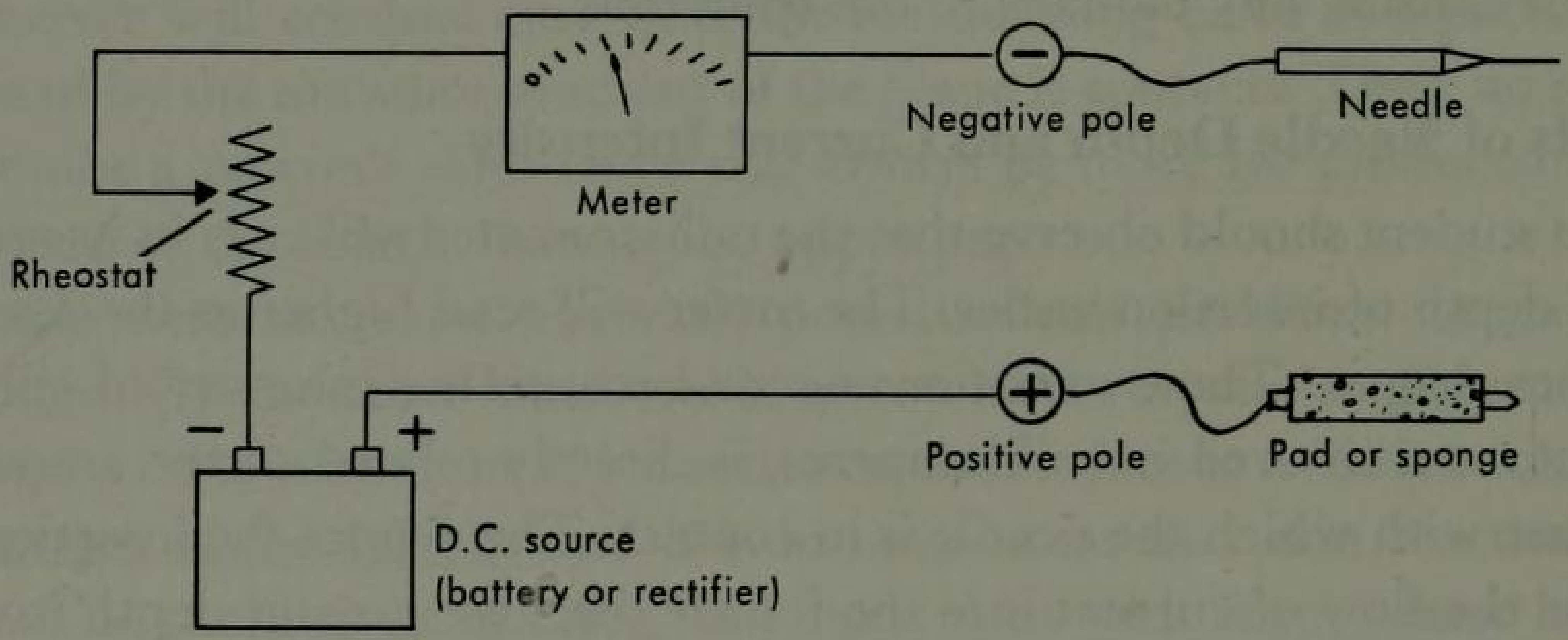


FIGURE 84. *A simple circuit of electrolysis equipment.*

This simple diagram shows a single needle circuit. If several needles were connected to the same negative terminal it would be called a multiple-needle unit. While the technic of application would be more complicated, the action at the needle would be the same.

When the patron is holding the pad or sponge electrode, or is in some way in contact with it and when, at the same time, the needle electrode is in contact with the moisture in the follicle, a complete circuit is established. The current will flow from the source, through the patron and back to the source again. All of the action of the current on the body is concentrated at the needle, where the current is most intense; that is, only the follicle is affected by the passage of current through the patron.

The positive electrode (also called the inactive, dispersive or indifferent electrode) is very large in area in comparison with the area of the needle, which is the reason why the hand or other part of the body in contact with it is not appreciably affected. A small amount of hydrochloric acid will be formed at the positive electrode during treatment, but it is distributed over an area large enough to make its normally caustic action ineffectual. Sometimes small breaks or fissures in the skin which have resulted from chapping, detergents or scratches acquire small concentrations of acid, causing the patron to experience an itching sensation. This discomfort can be remedied by moving the electrode to an unaffected area of the body, such as the forearm.

Tests for Polarity

When direct current is being employed, there are two possible actions which can take place at an electrode, depending upon whether the current is leaving or entering it. To put it in electrical terms, the electrode can be either positive or negative in polarity. The effects of these two polarities on human tissue are chemically opposite. *The negative pole produces an alkali, sodium hydroxide, whereas the positive pole produces an acid, hydrochloric acid.* Since the actions of these polarities differ greatly from one another, the student should be familiar with some method for testing her equipment for polarity. The following tests are designed both to demonstrate that there is in fact a difference in the effects of these poles and to provide a convenient method for determining which pole is being used. The following material will be needed to conduct your experiments:

2 pieces of wire about two feet long (bell wire or picture-hanging wire will do).
1 cup of water containing 1 teaspoon salt.
1 piece of red litmus paper, available at any prescription drug store.
1 wad of cotton.

Test (1) (Bubble test)

Procedure: Connect the bare ends of the two wires to the positive and negative terminals respectively on your machine. Place the opposite ends into a glass of salt water as shown in sketch.

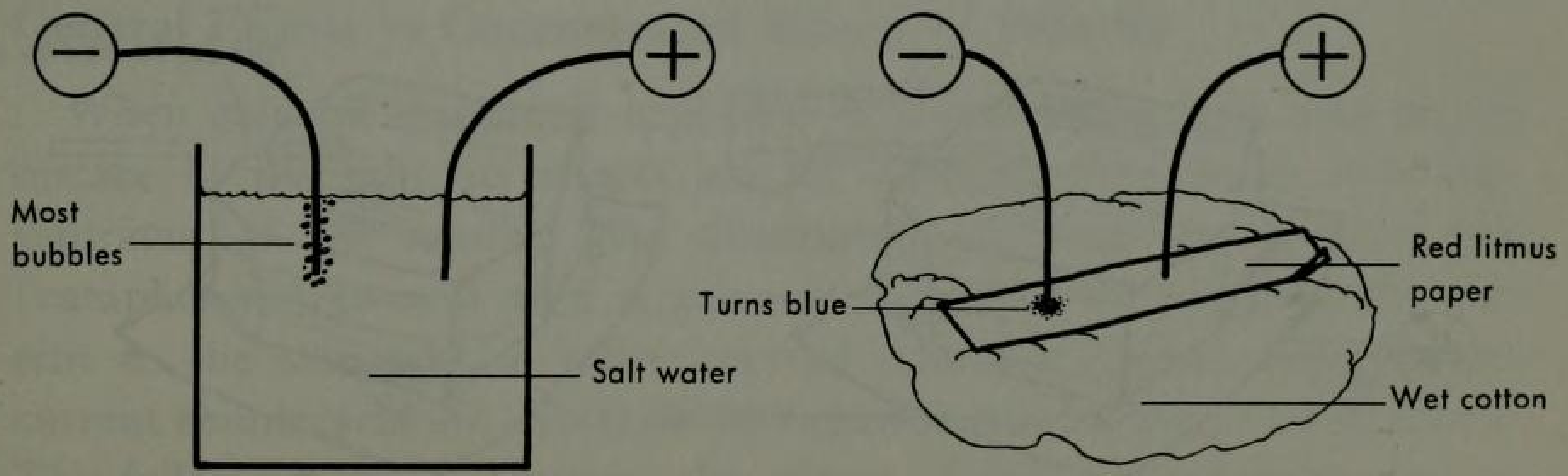


FIGURE 85. *Two polarity tests.*

Turn the galvanic current on and raise the rheostat from "0" until the meter reads about half scale (2 Ma.). Observe that the greatest number of bubbles will appear at the negative pole. This is called the bubble test for polarity.

Conclusion: In the water immersion test for polarity the *negative pole* shows the most bubbles.

Test (2) (Red litmus test)

Procedure: Use the same wires connected as before, but, instead of using the water glass, take a wad of cotton wet with salt water and place a piece of red litmus paper on it. Now touch both wires from the negative and positive poles to the surface of the wet litmus paper. Turn the galvanic current on and you will see the litmus paper turn *blue* only under the negative wire. Red litmus paper turns blue when acted upon by an alkali such as sodium hydroxide.

Conclusion: In the red-litmus-paper test for polarity the negative pole shows blue, the positive pole does not.

Effects of Polarity on Tissue

It has been mentioned that the concentrated action of galvanic current will produce an alkali (NaOH) at the negative pole and an acid (HCl) at the positive pole. Just how do they differ in their effect on the human skin? Another experiment will demonstrate.

Procedure: Using the same wires, connected as before, place a piece of beef (lean beef, 1 inch square, freshly cut so that the surface is not dried out) on a piece of foil or metal connected to the positive wire. Now lay the negative wire on the wet surface of the meat. See Figure 86. Turn the galvanic current on, adjust the rheostat to show about mid-

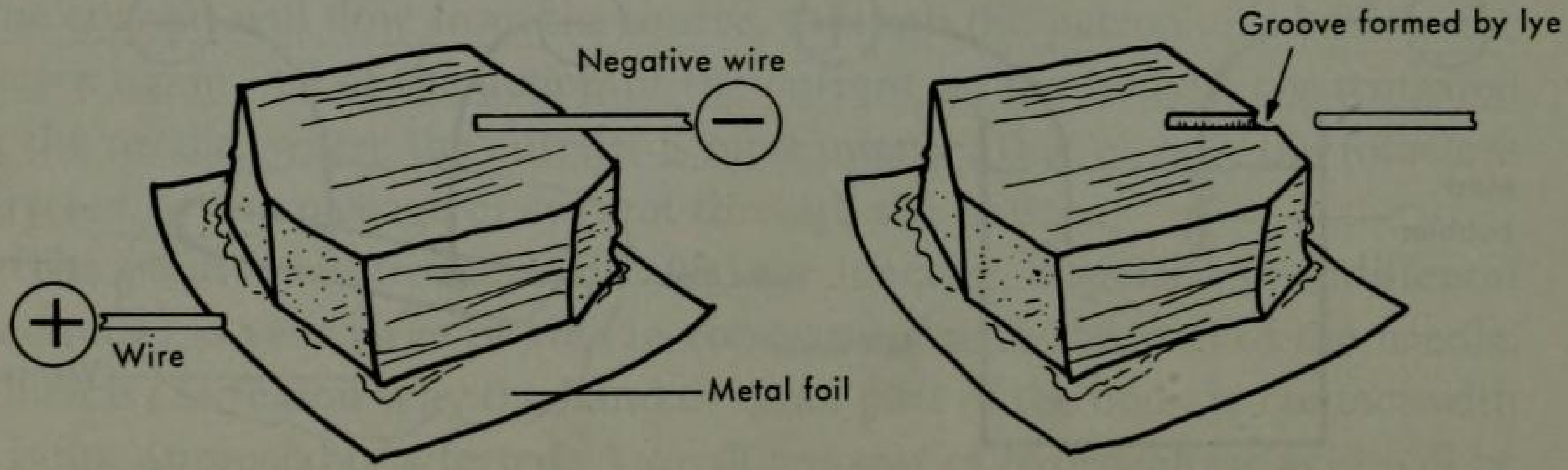


Figure 86. *Action of negative pole on meat.*

scale reading on the milliamperemeter and observe the effect of the negative current on the meat. Note the bubbles, indicating that sodium hydroxide is being produced. After the action has continued for about 2 minutes remove the wire and observe the groove that has been eaten away in the meat. At the point where the wire had been placed, the meat will still be red indicating that no "cooking" has occurred.

Reverse the polarity and repeat. A similar decomposition will be noted. However, an additional phenomenon, one that did not occur with the negative pole, takes place at the positive pole. The meat will begin to take on a dark color where it is in contact with the wire. The meat has not been cooked; the coloring is disintegrated material from the wire. Hydrochloric acid not only destroys tissue, it also destroys metal (exceptions: gold, platinum and several other rare metals). A fragile needle electrode of steel disintegrates rapidly from positive polarity.

Conclusion: Both negative and positive poles destroy tissue, negative by alkali, positive by acid. Neither pole cooks or whitens meat. The acid produced by the positive pole does, however, cause certain metals such as steel to disintegrate.

The action of positive polarity in the human follicle is something with which the student should not experiment. It is generally known in the field that accidental use of the positive pole with steel needles invariably produces a tatoo-like spot of black oxide where the needle has disintegrated in the follicle. Furthermore, the kind of scar left by this action is quite different from that left by negative galvanism. In those instances where normal negative treatment produces a scar it is much more supple than the hardened lump left by a positive treatment. Hydrochloric acid tends to dry out and harden the tissue, making it difficult to epilate the hair even when applying the current. There is no question that the *negative pole is the only pole to use in hair removal by electrolysis.*

General Effects vs Concentrated Effects of Polarity

When galvanic current is applied over a sufficiently wide area on the surface of the skin, its effects are far different than when it is concentrated at the needle. The distributed effect of the positive pole (cataphoresis) is used after a galvanic treatment by applying the current to the skin with a roller covered with wet cotton. The positive current counteracts the effects of the negative current used on the needle. The following chart compares the effects of the two polarities, first as concentrated on the needle, then as applied to the skin generally:

COMPARISON OF THE EFFECTS OF POLARITY

Pole:	**Positive Pole (anode)**	**Negative Pole (cathode)**
Electrical Charge:	+ (plus)	− (minus)
Red Litmus Test:	Does not change color	Turns paper blue
Bubble Test:	Few bubbles	Many bubbles
Effects on Skin When Concentrated On Needle	1. Produces concentrated hydrochloric acid. 2. Destroys tissue. 3. Disintegrates steel needles. (Blackens tissue.) 4. Forms hard scar tissue.	1. Produces concentrated sodium hydroxide. 2. Destroys tissue. 3. Has no effect on needles. (Does not discolor tissue.) 4. Forms supple scar tissue.
	Cataphoresis	*Anaphoresis*
Effects on Skin When Distributed By Roller	1. Hardens and firms tissue. 2. Soothes. 3. Reduces redness (as a vaso constrictor). 4. Germicidal (acid kills germs).	1. Softens and relaxes tissue. 2. Irritates. 3. Promotes redness (as a vaso dialator). 4. Germicidal (lye kills germs).

The above chart, having been drawn up specifically for the electrologist, is more complete than charts used by cosmetologists for facial work. Only the electrologist is uniquely concerned with the concentrated as well as the distributed applications of current. Other, more detailed distinctions among various currents may be found in the works on electrosurgery listed in the bibliography.

Effects of Needle Diameter on Treatment

An additional theoretical factor that is of prime importance to the electrologist is the needle diameter. Obviously the greater the needle's diameter (thickness) the greater will be the area of its surface. Now, if the amount of current flowing through the needle is a fixed amount—one milliampere for example—it follows that the thicker the needle, the greater the area through which that fixed amount of current can flow. This means that on a thick needle, the intensity of the current will be distributed over a greater surface, so that the intensity per unit area, that is, the intensity of current at any one "point" on the needle, will be less than it would be for a thinner needle carrying the same amount of current.

When we realize that the nerve bundles associated with a follicle are not distributed throughout the follicle walls, but are limited to certain small areas of contact with it, we can see that it is not the total current applied to the follicle but the amount of current applied to the nerve contact points that causes pain. The intensity-per-unit area becomes the crucial factor in the causing of pain. It follows from this that the *greater the diameter of the needle, the less pain the patron will experience from a given intensity of current.* You can observe this for yourself by comparing the effects on your own nerves with first a thin, then a thick needle at the same milliammeter reading.

Selecting the Needle

The first step in applying our theory is to select a needle that suits the task at hand. It should be smooth, polished and have a round point because it is going to be slid into an epidermal tube or cavity that could be easily pierced by a sharp point. *The diameter of the needle should be, at first selection, equal to the diameter of the hair being treated.* There are exceptions to this but it makes an excellent rule of thumb. Experience will show that a follicle can easily stretch to twice the diameter of the hair, allowing insertion with little or no pressure. Excessive expansion by a larger needle could break the capillaries surrounding the follicles and cause black and blue marks.

Employing a needle of smaller diameter than that of the hair increases the intensity per unit area of the needle and thereby increases the pain factor. We have used needles as small as .001″ in research work, but no worthwhile advantages were found when using a needle of such small area that would offset the disadvantages of fragility of the needle and pain to the patron.

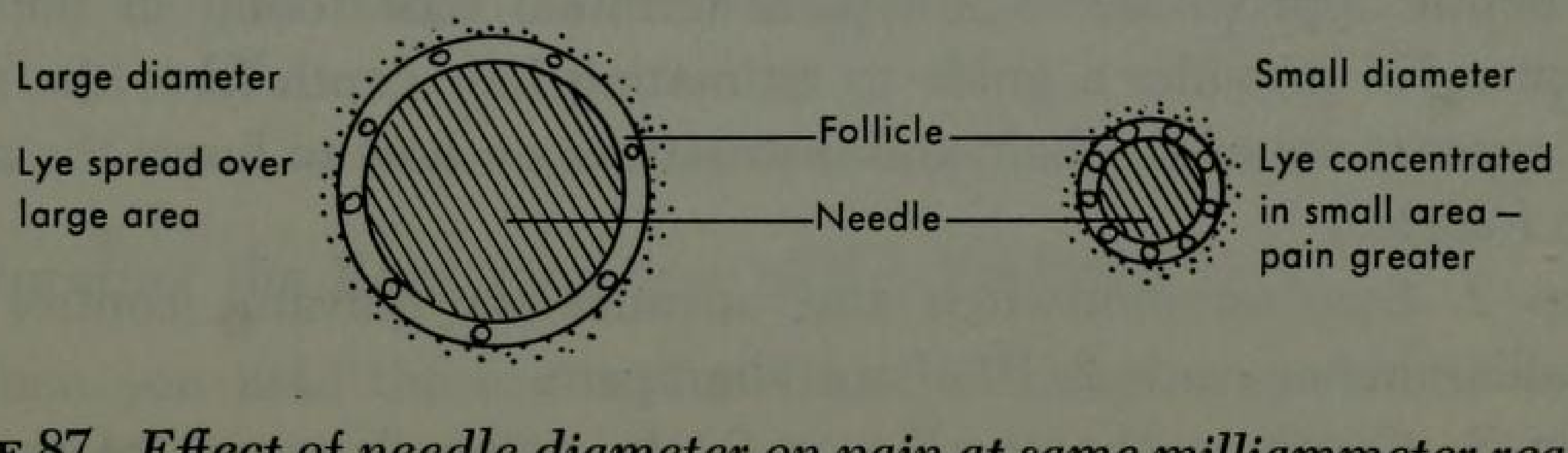

Large diameter
Lye spread over large area
Follicle
Needle
Small diameter
Lye concentrated in small area – pain greater

FIGURE 87. *Effect of needle diameter on pain at same milliammeter reading.*

The next point to consider is the length of the needle. This must be based on the depth of the follicle. With experience you will find that the larger diameter hairs and faster growing hairs are the deepest; conversely, the smaller diameter and slower growing hairs are the most shallow. Select a needle long enough to reach to the full depth of the type of hair to be treated. It is safer to select a needle that is too long rather than too short. As mentioned in Chapter III, *a hair in the later stages of anagen is the one to select* when making your needle depth tests.

Procedure for Setting Up the Galvanic Technic

Your next concern will be to set up a technic for applying galvanic current to the follicle. In undertaking this important phase of the treatment, you must bear in mind that no two cases will ever be alike, and for that reason your technic will have to be "tailored" to each individual problem during treatment. The procedure for setting up the technic must therefore be one which takes into account such varying factors as moisture gradient, skin sensitivity, and pain. The following step-by-step instructions are intended to guide you to a technic that will be as effective and efficient as the circumstances will allow.

Before you begin treatment, it is essential that the patron have a good contact with the positive electrode. If the electrode is of the type that is held in the hand, the current will vary in intensity according to the tightness of the patron's grip. It is not uncommon for the milliammeter to rise and fall during treatment as her hand changes its contact with water, pad or sponge. Have the patron contact the positive electrode in such a way that she can maintain the position comfortably. A conducting solution of tap water and salt (two OR HEAPING rounded tablespoons per quart) provides the best contact with the least electrical resistance when used with a wet sponge or pad or in a water-cup electrode.

In beginning the treatment, you will, of course, have selected a *sterilized* needle appropriate to the typical hairs of the area to be treated. Install the needle and turn the epilator on. Be sure to sanitize the patron's skin before treatment. (See Chapter V for sanitation instructions.)

Step 1. With galvanic rheostat control set at zero, insert the needle to a depth appropriate to a typical terminal hair found in the area. (Chapter III provides a guide to estimating hair depth from the superficial appearance of the hair and instructions on how to insert the needle in the follicle.)

Step 2. Step on footswitch and advance the galvanic control until the milliammeter reads 2/10 of a milliampere.

Step 3. Continue the current at 2/10, testing looseness of the hair with your tweezers. When the hair can be easily slid from the follicle, remove it. Also remove the needle, since it may be presumed ficient lye has been produced to effect the desired destruction of Total time required: from forty-five seconds to one and one-half min depending on the depth and coarseness of the hair.

Step 4. Examine the root of the epilated hair. If it is of a type that will afford a depth gauge (hair in later anagen) adjust the depth of your next insertion accordingly. (See below.)

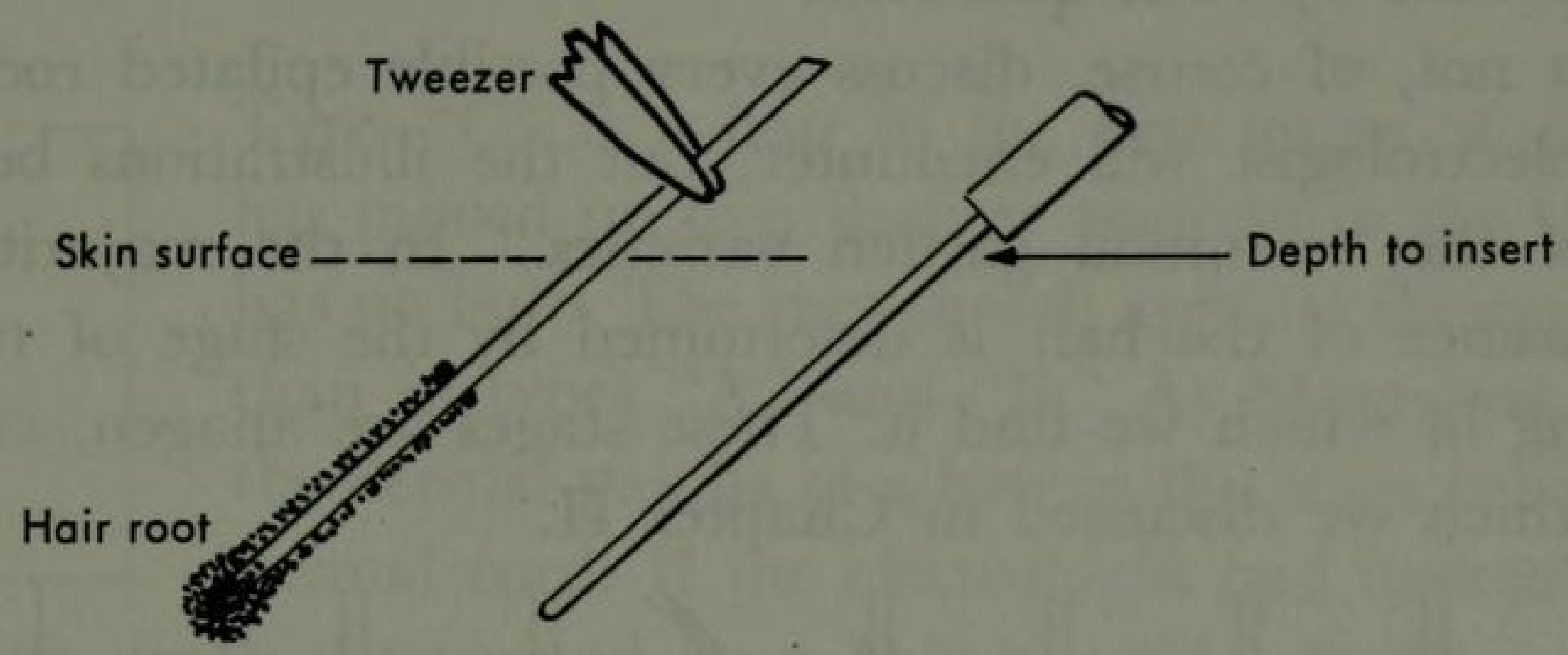


FIGURE 88. *Determining depth of insertion.*

Step 5. Reinsert the needle in the follicle of a similar hair. If the patron found the pain of the first application quite within her tolerance level, advance the control so that the milliammeter registers another tenth (3/10). By thus increasing the quantity of current you are shortening the length of time required to do the job. Further steps may involve additional increments in current. As mentioned in regard to lye production, the amount of lye produced = current × time; *the necessary amount of lye is produced faster when the current is increased.* Therefore the more current your patron can take the faster you can work.

The pain factor is one of the most vital guides you have to proper treatment. To destroy hair you must destroy tissue. When tissue is destroyed, pain naturally ensues. If there is no pain, no tissue is being destroyed. Thus, a painless treatment is a worthless treatment. Conversely, the greater the pain your patron can tolerate, the more efficient you become. Keep in constant communication with the patron concerning the pain factor. Work within the pain threshold, as discussed in Chapter IV.

Interpreting the Root Structure of the Epilated Hair

When you hold the first epilated hair in your tweezers you may see a "perfect" root structure, i.e., one with bulb and root sheath intact. If you did everything you were supposed to, this root structure should give you the feeling of a job well done as far as technic is concerned. However, frequently—and especially during your first attempts—you will see root structures that are not perfect, and unless you know how to interpret these imperfect-appearing roots, you will easily be confused. Why do you fail to get a bulb on all hairs? Why is there no root sheath on some roots? Was your needle at the proper depth? Without some basis for interpreting the appearance of the epilated hair, you are bound to be perplexed by such questions.

We can not, of course, discuss every possible epilated root structure that the electrologist will encounter, but the illustrations below represent all of the "common garden varieties." In the majority of cases, the appearance of the hair is determined by the stage of replacement or shedding in which we find it. These stages are anagen, catagen and telogen, which we discussed in Chapter II.

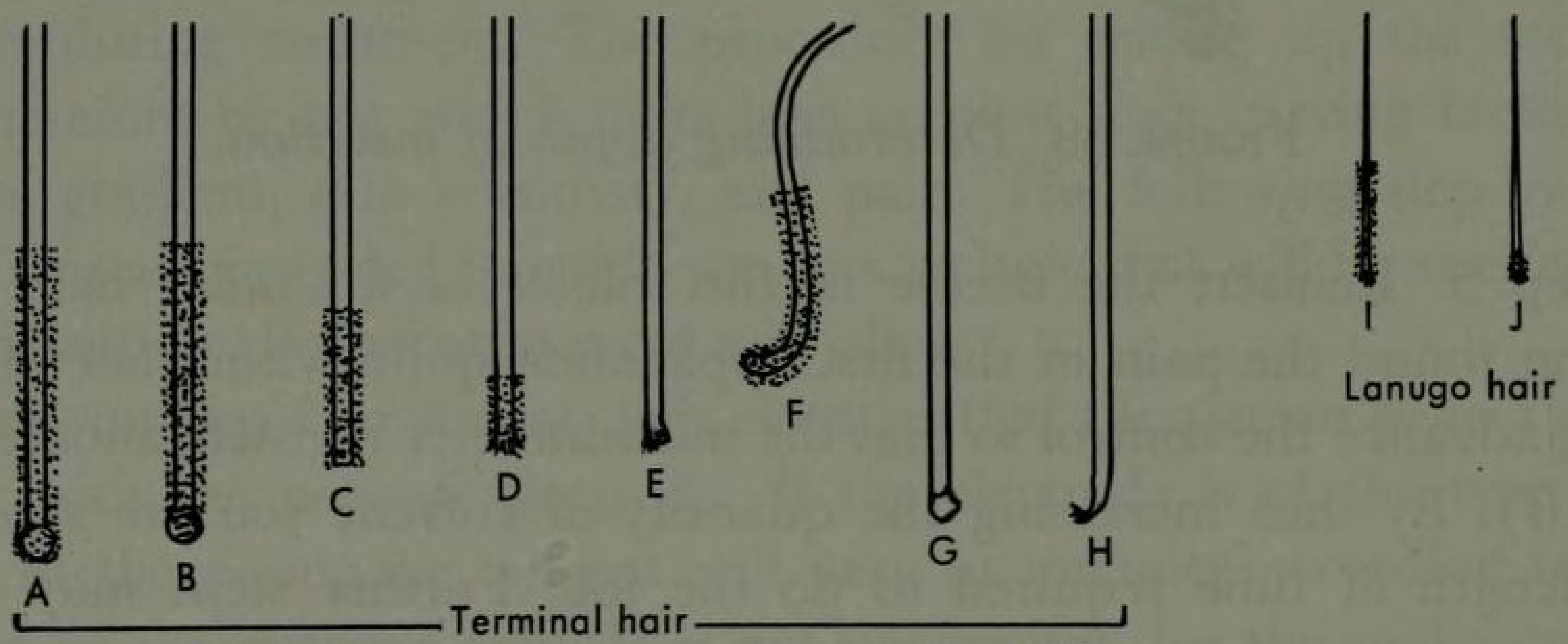
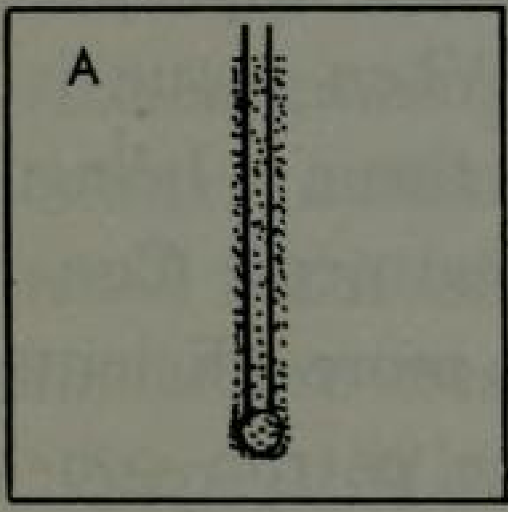
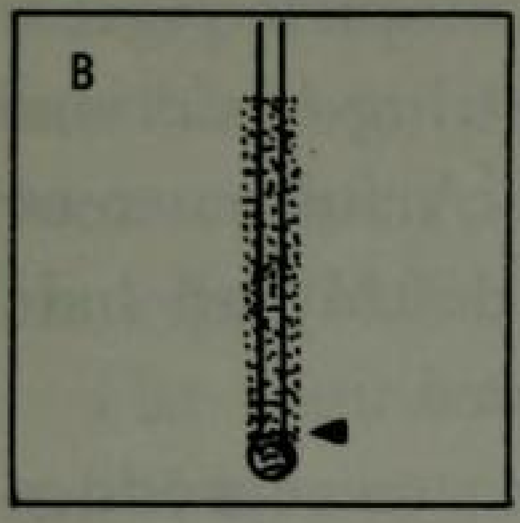


FIGURE 89. *Appearance of epilated hair roots.*

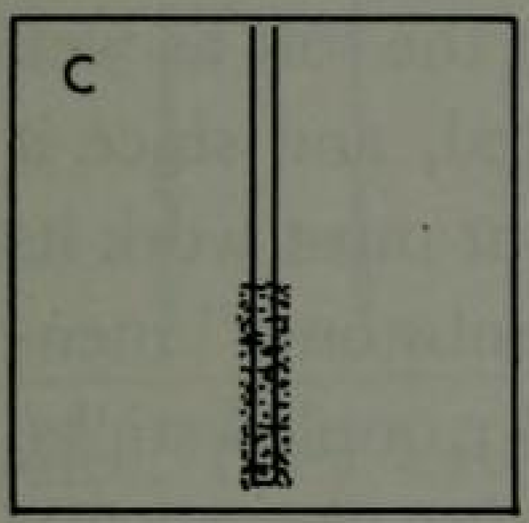
Let us catalog each of these typical types, consider why they appear as they do and then determine their significance for our peculiar problem. The root structures labeled "A" through "H" are all terminal hair. Roots "I" and "J" are lanugo type hair.



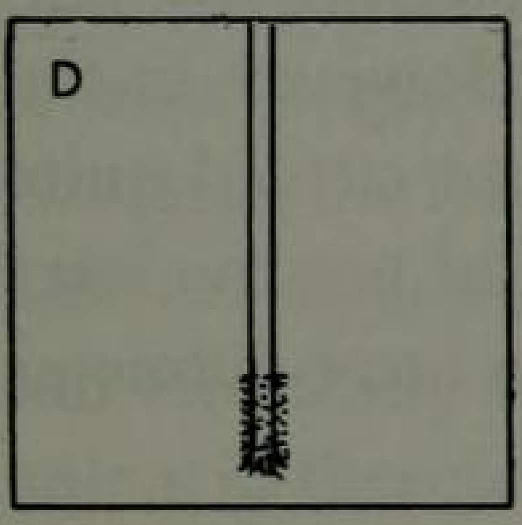
Type "A" is a hair in a later stage of anagen. This is the electrologist's dream, the ideal type to use as a guide to the depth to which we should make the insertion for subsequent similar hair. If this hair epilates with little or no traction we can assume that the hair elipated because of the action of the current, not because it was tweezed. *However, this is no proof of lethal dosage to the vital cells.* Roots like this can often be extracted with just plain old plucking. Just pull a few hairs out of your head and you will find at least one with Type "A" roots. When this root structure appears as the result of a treatment that allows the hair to be epilated with little or no traction we have assurance of good workmanship and technic, but not necessarily permanence.



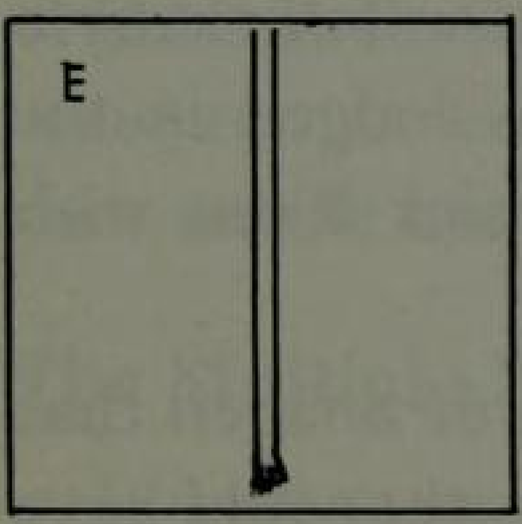
Type "B" is also a hair in later stages of anagen. This hair should be considered as good a guide of insertion as type "A." The line of demarcation just above the hair bulb (see arrow) has no relation to the needle's depth, as you might expect, but seems, rather to be due to cell structure change in the inner sheath, which causes a constriction of the root formation as the cells sweep upward from the bulb.



Type "C" is a hair in the first stages of catagen. It has moved up to a shallow position in the follicle and has no bulb. The root sheath appears shorter in length than in types "A" and "B." As Montagna indicates, the dermal papilla of a hair in this stage is beneath the dermal cord. If the electrologist had inserted into this follicle to the depth determined by a hair like "A" or "B," the action of the current would have been effective because the needle went lower than the "C" root. The needle would have gone through the dermal cord and beyond where regenerative parts are located. Do not shorten the depth of insertion when you view a "C" type root.



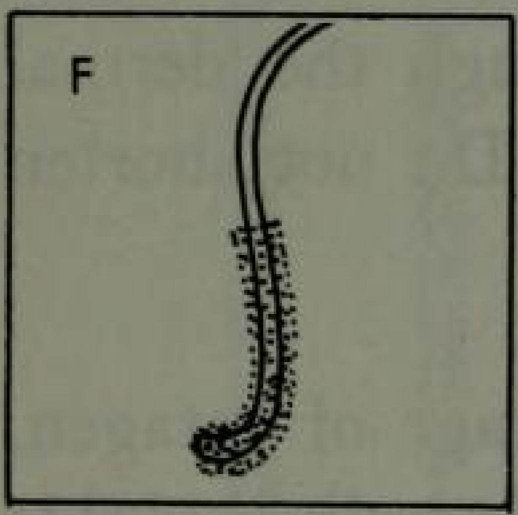
Type "D" is a club hair in the last stage of catagen, which means that it is very shallow. No bulb is visible and the root sheath is not very moist. This hair would not have shown signs of loosening until the needle had been in the follicle for at least half the time it normally takes to epilate a hair. On extremely dry skins hairs of this type will not release without traction. Since your insertion was based on an "A" or "B" type root your needle went much deeper than the point from which hair "D" grew. Problems connected with this shallow type of hair are identical to those of hair "E."



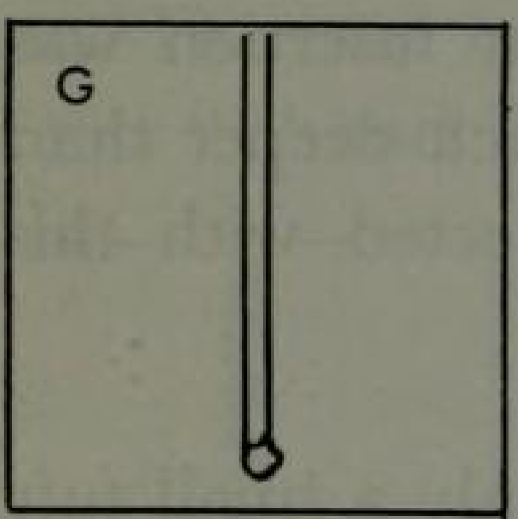
Type "E" is a club hair in telogen. Only a small tuft of broom-like fibers appears on the end of this hair. This is the kind of root structure you will see on the hairs that come out on your hair brush. The action of the current would have shown little or no effect on the release of this hair until the very end of the usual treatment time. Inserting far below the depth of hair "E" creates the same problem that exists in treating hair "D." In either case it is difficult to know exactly what the currents have done to the follicle. There are two possible actions which could have taken place:

(1) If the lower portion of the follicle had gone into complete regression (or morphogenic degeneration), then just a cord or string of dermal cells remained beneath the late catagen or telogen hair. A full current dosage at anagen depth would have been necessary to destroy all hair germ cells in the outer sheath as well as in the dermal cord.

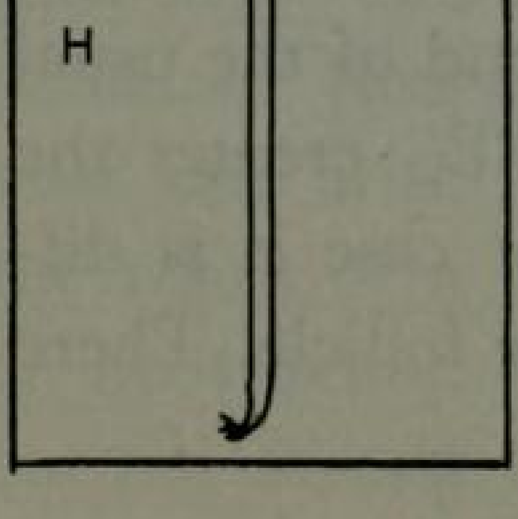
(2) If the dermal papilla was reactivating and starting to reproduce a new hair, the needle would have descended into the region of a new hair growing beneath the club hair. Complete electrical action would have destroyed the regenerating dermal papilla and the newly-formed hair structure. Since the embryonic hair was still partly in the soft as well as the hard keratin stage when its development was halted, and since it did not protrude above the skin, it could not be epilated but must work its way out of the follicle on its own. Such hairs are the "tombstones" mentioned earlier. They appear as very dark, brittle, dull and rumpled sticks. They usually appear four to five weeks after a treatment, tiny monuments to a departed follicle. Do not give them further treatment, just lift them out.



Type "F" is a curly or kinky hair in later anagen. Its shaft diameter above the skin will show it to be oval or flat. The flatter the visible hair shaft the greater the curve of the follicle. Except for the fact that it curves, everything we have stated about the straight roots "A" through "E" also applies to root "F." However, in the early anagen stage the curly hair follicle and hair root is not curved quite so much as it will be in later stages. Here again you should use the later anagen hair as a depth guide for your needle insertion. Use a large diameter round-pointed needle.

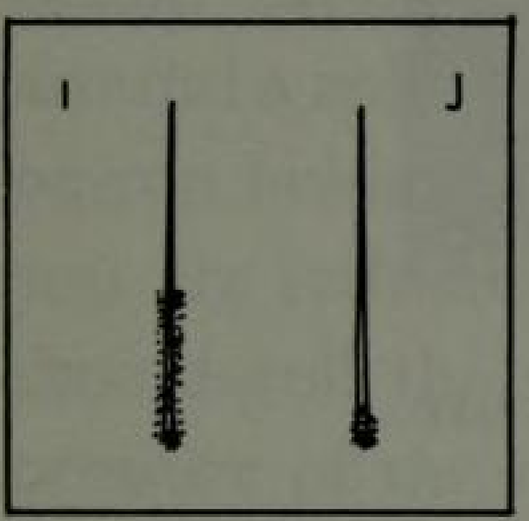


A hair that looks like type "G" could be one of two things: (1) A hair in anagen or catagen that has had its root sheaths skinned off, or (2) a hair that had been insufficiently treated. If this hair was epilated with little or no traction, it could have been sufficiently treated; its root sheath was merely withheld in the follicle by a tight dry epidermis. In either case, if the root sheath has lodged in the mouth of the follicle in the form of a little ball of tissue, pick it out with your tweezers.



Type "H" is a hair in some later stage of anagen that had its root sheaths skinned off. The sheaths could have remained in the follicle or inverted as the hair parted from it, leaving a little transparent sleeve (outer root sheath) sticking above the follicle mouth. The extreme end of the root has a slimy soft tip due to the fact that it has parted from the upper bulb in the soft-cell-formation stage. If this hair had been fully treated and released without traction, the follicle may yet have been destroyed. However, most undertreated or tweezed hair look like type "H."

The beginning student in the first few hours of practice usually views only hair roots of type "E," "G," and "H." But do not be discouraged; one day you will epilate a type "A." (Crochet needles not permitted.)



Lanugo or vellus hair are colorless and of very small diameter. They grow from a lobe of the sebaceous gland, of which they are an "appendage." They undergo a replacement or shedding process, which, however, is not so complex a procedure as that of terminal hair. Their root structure varies from "I" to "J" in appearance. They have no bulb or pigment. When they do become pigmented, a bulb has come into existence at their base and they are on their way to becoming an intermediate hair. Root "I" would indicate the later anagen type which we would use as our insertion-depth guide. Root "J" is in telogen, just about to fall out.

Lanugo hair are troublesome from many standpoints. Because they are so small and colorless they are difficult to see. They are also so numerous that it is hard to find the pore from which each is growing. In addition, the sebaceous gland from which each lanugo hair grows has several lobes. Locating the lobe in which the hair root is located poses a problem. Lanugo hair are seldom treated with galvanic current nowadays since thermolysis can effectively remove them much more quickly. The treatment of lanugo hair will therefore be taken up in greater detail in subsequent chapters.

In summary, any hair which epilates with a root structure appearing like types "A," "B" or "F" is a good guide to the depth of insertion for all similar hairs in the same area. All other types shown fail to indicate the full depth to which hairs in the vicinity grow. Only by adjusting your needle depth according to "A," "B" or "F" will you be able to reach the papillae of hairs in the later stages of anagen. The entire lower follicle of most hairs—no matter what stages they are in—will be subjected to current action if your needle has been inserted to the depth of the average hair in anagen.

The Multiple-Needle Technic

It was mentioned earlier that the multiple-needle technic established electrology as a practical, effective method for removing hair. Nowadays, however, the technic is obsolete. The newer high-frequency methods, though not nearly so thorough, permit the operator to use a single needle with greater ease and speed than does the clumsy, complicated multiple-

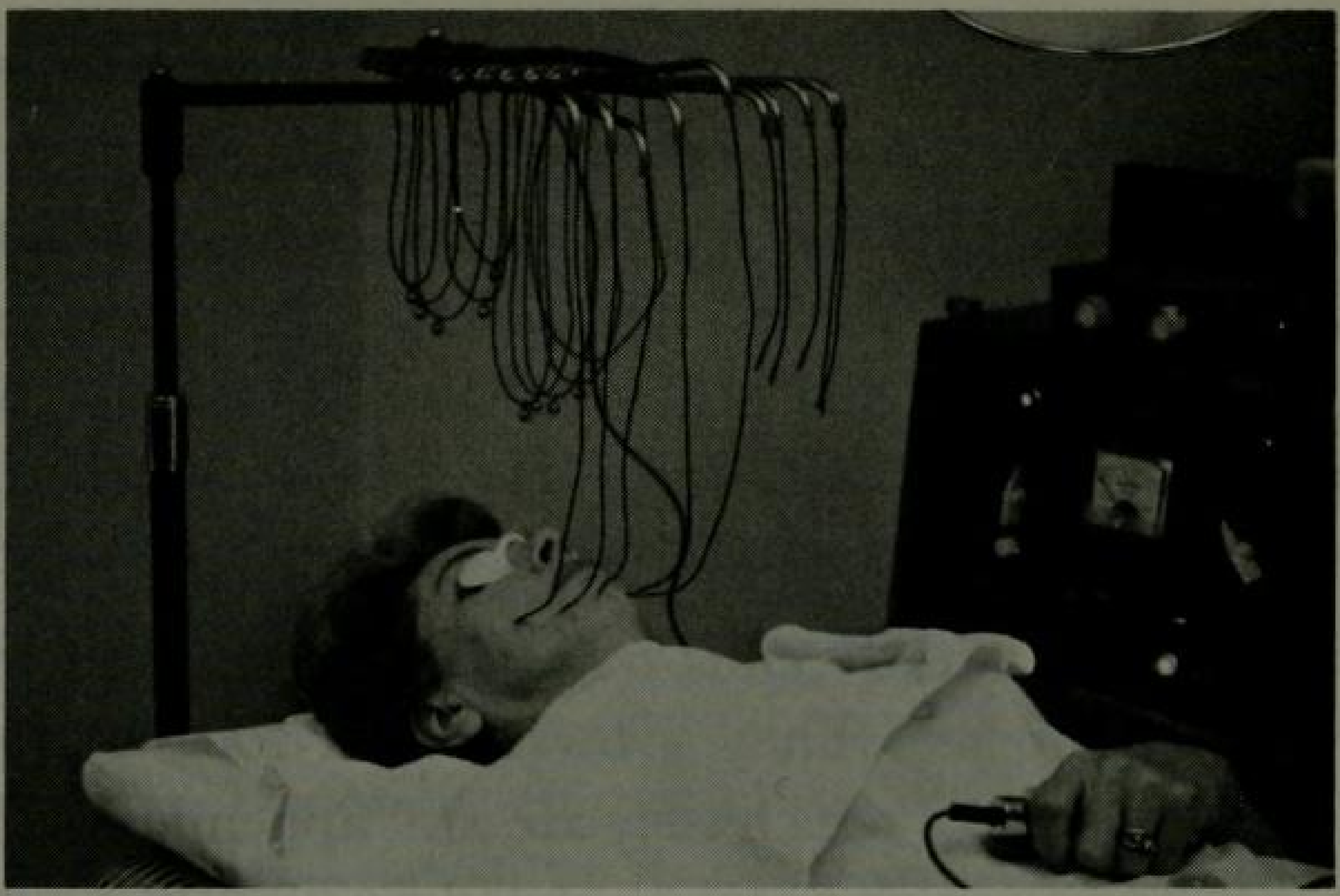


FIGURE 90. *The multiple needle equipment in use.*

needle method. The multiple-needle machine with its octopus-like wiring has the further disadvantage of looking to the patron like something specifically designed to produce pain.

Nevertheless, most states that include an examination as part of their licensing requirements insist that the student have a knowledge of the multiple-needle technic. For this reason we offer the following step-by-step instructions for the operation of the multiple needle machine.

Before beginning the treatment you must sanitize the area to be worked on and sterilize your needles in the prescribed manner. Commence by turning on the machine, with the rheostat set at zero. Insert the first needle farthest from you, and advance the rheostat so that the milliamperemeter reads 2/10ths. Then insert a second needle and increase the current to 4/10ths. Insert a third needle and increase the current to 6/10ths. At this point, check to see if the first hair is ready for epilation. If it is not ready, and if the patron is not experiencing too much discomfort, you may insert a fourth needle. Return to the first needle, epilate the hair, and reinsert the needle into another follicle. There is no need to lower the current as you move the needle from one follicle to another. The current is allowed to remain on for the entire duration of the treatment, the needles being alternately moved from follicle to follicle. When you are ready to terminate the treatment, remove a needle, reduce the current 2/10ths, remove the second needle, reduce the current another 2/10ths, etc., being sure to turn the current off completely before the last needle is taken out. At this point the area should be cataphoresed, which consists of rolling the positive pole over the area treated.

Cataphoresis and Anaphoresis

X **Cataphoresis** is the use of the positive pole (usually in the form of a roller) to distribute galvanic current over the skin. It derives its name from the fact that its action drives certain ionic and metallic substances to the *cathode* or negative pole. In electrology, cataphoresis has two main functions: (1) it firms the skin, soothes the nerves and reduces redness (see comparison chart in early part of chapter) and (2) it counteracts the effects of negative galvanism by neutralizing the sodium hydroxide produced in the follicles.

Cataphoresis is most commonly accomplished by winding a piece of cotton saturated with some conducting solution, usually an antiseptic, around a roller that is attached to the positive terminal of the machine. The patron holds the negative pole in her hand to complete the circuit. Because you are reducing redness at the same time you are soothing the skin, you should roll the skin in the direction of "blood return" to the heart, the pressure of the roller thereby forcing the blood away from the area while the capillaries are contracting from the action of the current.

Anaphoresis (the use of the negative pole) irritates the skin and promotes redness. It is used by cosmetologists as part of a facial treatment but is not used by electrologists. *Phoresis* literally means the forcing of a liquid through an unbroken membrane. Both anaphoresis and cataphoresis have the capacity for propelling certain chemical substances into the skin and therefore may, at some future time, provide the means of introducing a mild anesthetic into the area to be treated, thereby deadening the nerves before treatment begins. According to certain cosmetology books, some kinds of astringents can be forced into the skin by phoresis.

Summary

Galvanic technic still plays an important, if diminished role in the practice of electrology. It is unfortunate that some electrologists ignore it altogether, since, without some use of galvanic current, certain deep, coarse hair growths are almost impossible to remove permanently. Most modern electrologists have found it necessary to be equipped with both galvanic and high-frequency, realizing that although galvanic is slow, it is sure. Galvanic current is a necessary ingredient of the blend, which we shall discuss in Chapter X. The technics you have gained from this chapter will be of great advantage in perfecting both high-frequency and blend technics.

Chapter IX

Thermolysis

Although thermolysis is the method used by most modern electrologists today, few operators have ever completely understood how its action destroys the vital parts of the follicle. Most electrologists know that some kind of heating or cooking takes place, but the exact details of the process are unknown to them. Many of the principles of high-frequency treatment to be discussed in this chapter have never before appeared in an article or book on the subject of electrical hair removal and may for that reason raise some honest inquiry concerning their accuracy. To satisfy any skepticism the reader may have, a series of experiments has been included in the chapter to enable the reader to confirm the findings reported herein.

The student, with the aid of a magnifying glass or jeweler's loupe, will be able to see for herself just what takes place around the needle under various conditions during the application of high-frequency current. She will see why we must adjust our high-frequency technic to suit each patron's unique skin, nerve and hair condition. The experiments will show why one high-frequency technic is superior to another on certain hair problems. They will also demonstrate the inherent weaknesses of high-frequency current when used by itself, a problem to be taken up again in the chapter on the "blend."

History

The discovery of the phenomenon of high-frequency current came about only after electrical science had developed to a highly sophisticated level. Since the time of its discovery, an enormous amount of research has been devoted to the field. Research on high-frequency has therefore had such a vast and complicated history that only a few of the major developments which led to our eventual use of high-frequency current in electrology can possibly be considered here.

Heinrich Hertz is considered the first scientist to demonstrate the existence of high-frequency waves. Work by many previous investigators enabled him in 1888 to develop an "oscillator," which, by use of a "spark gap," produced radiations capable of penetrating walls and floors. In honor of their discoverer, these radiations were named Hertzian waves. In 1890 Professor Arsene d'Arsonval of Paris found that Hertzian waves, when induced into the human body at oscillation frequencies of 10,000 cycles per second, would not produce the muscle stimulation that lower frequencies had been found to produce. He continued his experiments, demonstrating in 1892 that one ampere of current, a normally fatal intensity, could be passed without harm through a circuit which included his own body, his assistant's body and a lamp bulb. High-frequency oscillation had reduced the current's harmful effects. The only sensation Professor d'Arsonval noted during the experiment was that of a mild heating of the wrists, which he did not recognize as important.

In 1896 Guglielmo Marconi became the first man to produce high-frequency oscillations of sufficient strength that they could be broadcast over great distances. To him is given the honor of inventing the wireless. The term "wireless" was given this new communication medium because, unlike the telegraph, it did not need wires to conduct electrical energy from a source to a receiver. The alternative term, "radio" was applied to this phenomenon because it involved the radiation of electrical energy through space.

Van Zeynek is given credit for being the first (1899) to observe that organic tissue can be heated by high-frequency currents. This, of course, is now its main therapeutic value to the medical profession. At low intensities the mild, deep-heating action of this current is ideal for heat therapy treatments. At higher intensities the destructive effect of high-frequency is useful for electrosurgery and electrology. In the years following Van Zeynek's discovery, scientists investigated the ability of high-frequency currents to destroy tissue, eventually developing the "Electric Knife" for bloodless surgery (electro-section) and technics for electro-desiccation and electro-coagulation.

In 1923 Dr. Bordier of Paris, France, wrote the first article on the use of high-frequency current for the removal of hair. The new method promised greater speed and better results than the galvanic method already in use. Dubbed "thermolysis" because it destroyed tissue by heat, the use of high-frequency current was slow to be accepted among the majority of American electrologists.

Until the thirties all diathermy and electro-surgery equipment, including the electrologist's thermolysis machine, employed a "spark-gap" rather than vacuum tubes to produce high-frequency oscillation. The spark-gap was a crude device which induced rapid changes in polarity by passing sparks across a short gap in the circuit. It was easily influenced by changes in humidity and was difficult to control. The doctor or electrologist using the equipment had to listen to the sound of the hissing spark-gap to judge the intensity of the current, since he had no calibrated dials to guide him. Although Dr. Lee de Forest had invented the three-element electron tube as early as 1907, tubes capable of handling large radio-transmission currents were not developed until much later. These tubes were finally adapted to medical diathermy equipment in the early part of the 1930's, eliminating the need for unreliable spark-gap devices.

Even in the late 1930's the only high-frequency equipment of any consequence was modified medical equipment. Manufacturers specializing in hair removal equipment still favored galvanic current, and it was not until the 1940's that high-frequency became popular. Since then, high-frequency equipment has not changed appreciably. Although high-frequency equipment is constantly being modified, the basic principles of high-frequency current are the same for all machines, including those with transistorized circuits.

Definition of High-Frequency Current

Most cosmetology textbooks define high-frequency current as any electrical current which oscillates at 10,000 cycles or more per second. This definition is no longer correct, as the radio-frequencies table on page 144 indicates. High-frequency current is an oscillating current which ranges in frequency from 3 to 30 megacycles (3 million to 30 million cycles per second). The frequency of most electrology equipment in use today is 13.56 megacycles, one of three frequencies allowed by the Federal Communications Commission (F.C.C.). Use of equipment at an unassigned frequency is subject to prosecution under Federal Law. (The other assigned frequencies: 27.12 and 40.68 megacycles.)

High-frequency equipment has gone by many names—Radio Wave, Diathermy, Short Wave and Radio Frequency, to name a few—but these terms are misleading; all machines which remove hair by thermolysis (i.e., by heat destruction) operate on high-frequency at the F.C.C. assigned frequency. There is no need to be confused by novel brand names. All equipment presently on the market uses either galvanic current, high-frequency current or both. The majority of bizarre electronic names given to present-day equipment refer merely to standard high-frequency current. Although there is a possibility that ultrasonics or micro-lasers may be used in the future, no such electrology equipment currently exists.

The Electron Theory of High-Frequency Heating

High-frequency current has the capacity for creating an area of influence outside of the material which conducts it, i.e., beyond the conducting wire or needle. This area of influence is called the high-frequency *field.* Because high-frequency current is a current which is continually changing in polarity (direction) its field is also constantly altering its polarity. Any substance of an electrical conducting type which falls within this field is bound to be influenced by these oscillations.

Continuous electro-static attraction and repulsion created within the field by oscillations in polarity have the effect of producing a kind of "friction" in the atomic structure of the surrounding material. The "friction" in turn results in heat. This basically is the principle on which the high-frequency epilator works; it develops heat in that part of the follicle which is effected by the needle's high-frequency field.

To understand this more fully let us return for a moment to the atomic theory (explained in Chapter VII). The theory holds that matter is made up of molecules, which are, in turn, composed of atoms. An atom basically consists of protons and electrons, the protons comprising the greater mass around which the electrons, as negatively charged particles, continually orbit. The proton is positive in charge.

When certain kinds of atoms are placed within a high-frequency field, their electrons are alternately attracted and repelled by the continuously alternating polarity of the field. The electrons are thus moved or "strained" out of their normal orbits, as shown in Fig. 92. The energy

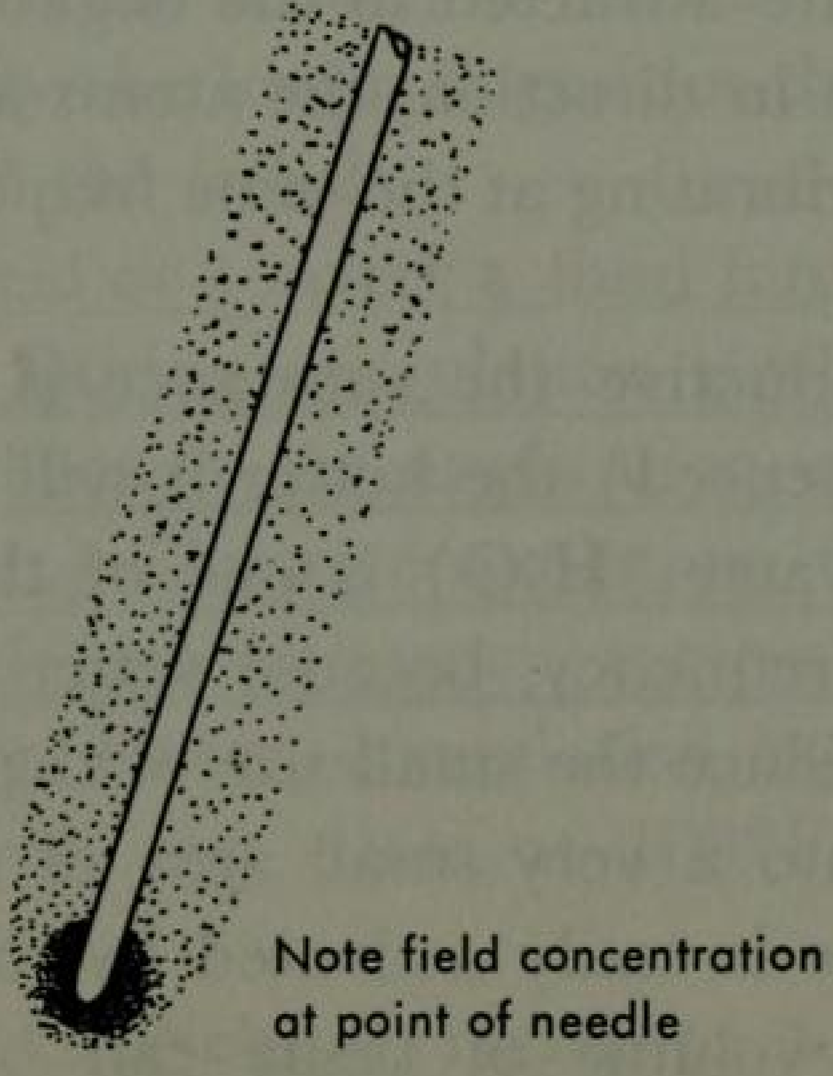


FIGURE 91. *High-frequency field around needle.*

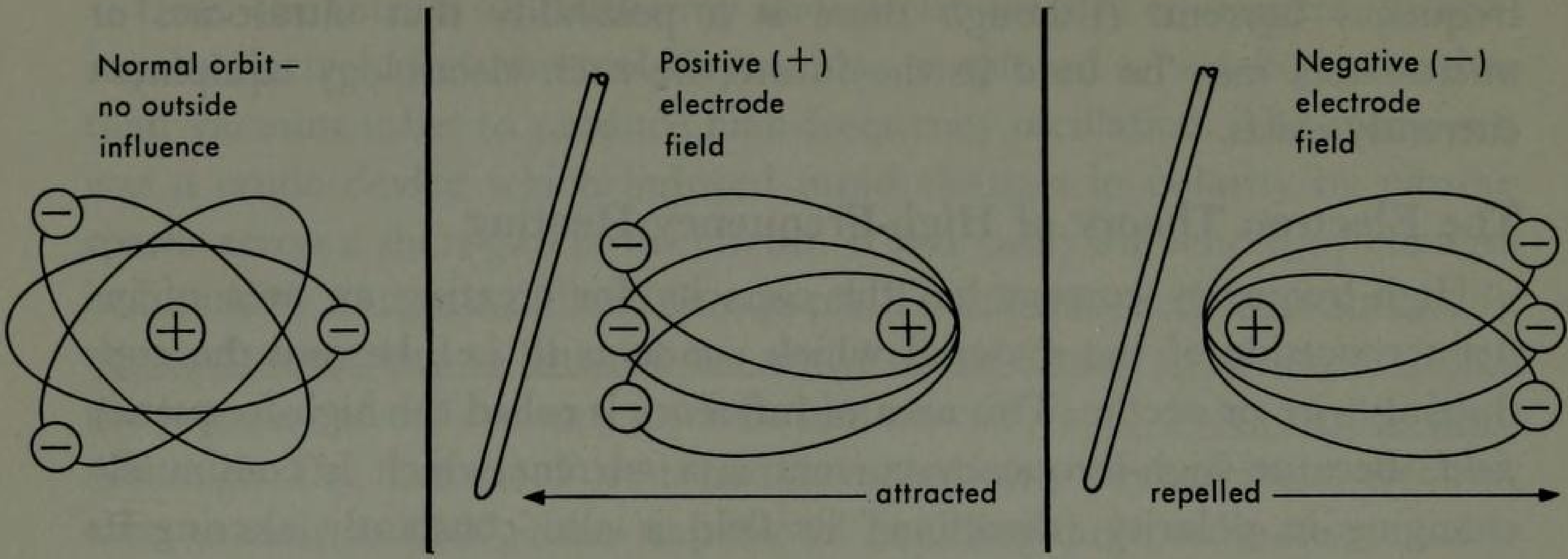


FIGURE 92. *Effect of electrode polarity on atom.*

involved in this pushing and pulling of electrons is converted into heat in the substance which the atoms comprise.

What we experience as "heat" in any substance is really the vibration of its molecules "against" one another. The more violently the molecules are jostled, the "hotter" they feel to the touch. This heat vibration can be observed in a simple experiment with a common paper clip. The paper clip is an object which resists being bent, because its molecules are "locked" together by their own magnetic interrelationships. If the clip is bent back and forth rapidly, the intercrystalline tension of its molecules tends to oppose the changes being forced on it. The resulting vibration among the molecules can actually be felt as "warmth" in the bent section of the clip.

A high-frequency field produces a similar heat vibration in conductive substances by means of its influence on electrons. When electrons are pulled out of their normal orbit, as they are by the high-frequency field, they tend to pull the rest of the atom along with them, since the positively-charged protons are attracted to the negatively-charged electrons. As the electrons alternate in direction, the atoms are inclined to move back and forth with them, vibrating at the same frequency. This vibration manifests itself in heat.

The more conductive the substance is (that is, the more easily its electrons are influenced) the hotter it will get. It is to the electrologist's advantage that water (H_2O) is one of those substances which readily respond to high-frequency, because water constitutes the major portion of human tissue. Since the small size of the needle concentrates the high-frequency field into a very small area of tissue, water moisture in and around the follicle is easily activated by the field. High current flowing through a small volume of tissue can build up heat rapidly and is capable of raising the temperature of tissue to the boiling point, although considerably less heat is sufficient to destroy the follicle walls, the papilla and other tissue responsible for the regrowth of hair.

IMPORTANT

It is the moisture in the tissue surrounding the needle which becomes heated by the high-frequency field—not the needle itself.

Examples of High-Frequency Heating

For several years carnivals and seaside resorts have used a high-frequency device to heat "hot dogs." The wiener is placed in the bun which is then placed inside a wax paper bag. All of this is placed inside a high-frequency coil. Within a few seconds the wiener is boiling hot. The bun is not heated nor is the wax paper bag affected. The action of the high-frequency takes place only in the moisture of the wiener. *This phenomenon is most important to the electrologist as she deals with areas of varying moisture content.* The more moist areas become the hottest, whereas dry areas are hardly affected.

High-frequency (microwave) ovens which are even higher in frequency than the coil mentioned above are available for home use. Here again the heat is produced within the meat itself, thus cooking it much faster than ordinary gas or electric ovens.

Modes of Tissue Destruction

The mode or manner in which tissue is destroyed by high-frequency depends on the degree of heat generated by the action of the current. Extremely high-intensity current, which creates sparks, can actually heat the tissue to the point of charring it, whereas lower intensities will produce *electro-desiccation* (a drying action) or merely *electro-coagulation* (a cooking action). It is only the lower intensities that are suitable for eliminating the vital parts of the follicle.

To "coagulate" is to congeal or convert a fluid into a thickened mass as in the boiling of an egg. During coagulation a whole new chemical structure is brought about through the application of heat. (Compare a fresh egg with a boiled one.) Electro-coagulation, then, is the coagulation of tissue by means of high-frequency current, a process which "cooks" the tissue like an egg. Electro-coagulation can be accomplished at relatively low temperatures: egg white at 109°F, human tissue at 127°F.

To "desiccate," according to Webster, means to deprive of moisture, to dry up. Electro-desiccation is therefore the desiccating effect of extreme heat on tissues of the body, induced by intense high-frequency current. The moisture in the tissues is vaporized, leaving dead, dried out flesh. Because body fluids boil away only at 212°F, electro-desiccation requires greater heat than does electro-coagulation. Ordinarily, only the "flash" method of high-frequency treatment causes electro-desiccation (as evidenced by the adherence of dry tissue to the needle and the vapor blast in the follicle). Electro-desiccation and electro-coagulation are equally effective in destroying follicle tissue.

A third way to destroy tissue is to char it. By heating tissue to an extreme degree, it can be made to combine with oxygen and burn just like kindling wood. This is obviously far too violent a method for destroying the lower portion of the follicle, and yet one can still find certain old books and pamphlets in circulation which advocate the use of "sparks" and watching for little curls of smoke from the follicle. Sparking will certainly char the follicle tissue, but it will also produce enough heat to overtreat skin surface and cause considerable pain.

This error in advocating a "sparking" action at the electrologist's needle probably arose out of medical literature written about spark-gap equipment used in electrosurgery. Having been designed for general electrosurgical work, the early equipment operated at much higher intensities than those presently used. In those early days the doctor would test the machine by letting a spark leap from the needle to a thumbnail, a relatively painless procedure. But sparks in the follicle are quite another matter. Because several brands of equipment are able to this day to produce a sparking intensity of current, considerable caution should be exercised when setting the intensity of these machines at higher levels.

The Importance of the Heating Pattern

The shape or form of the heated area surrounding the high-frequency needle is called the *heating pattern.* It is not to be confused with the high-frequency field, the shape of which is often quite different from the heating pattern it creates. This is because the heating pattern will develop only in those parts of the follicle which contain significant amounts of moisture. Obviously the manner in which the high-frequency field distributes its heating pattern throughout the follicle will determine the effectiveness of a treatment.

If the electrologist were simply going to use a hot needle to destroy hair, the heating pattern would be exactly opposite to what is desired. Suppose, for example, that an ordinary sewing needle were inserted into a one inch cube of beef and a match or candle were held under the

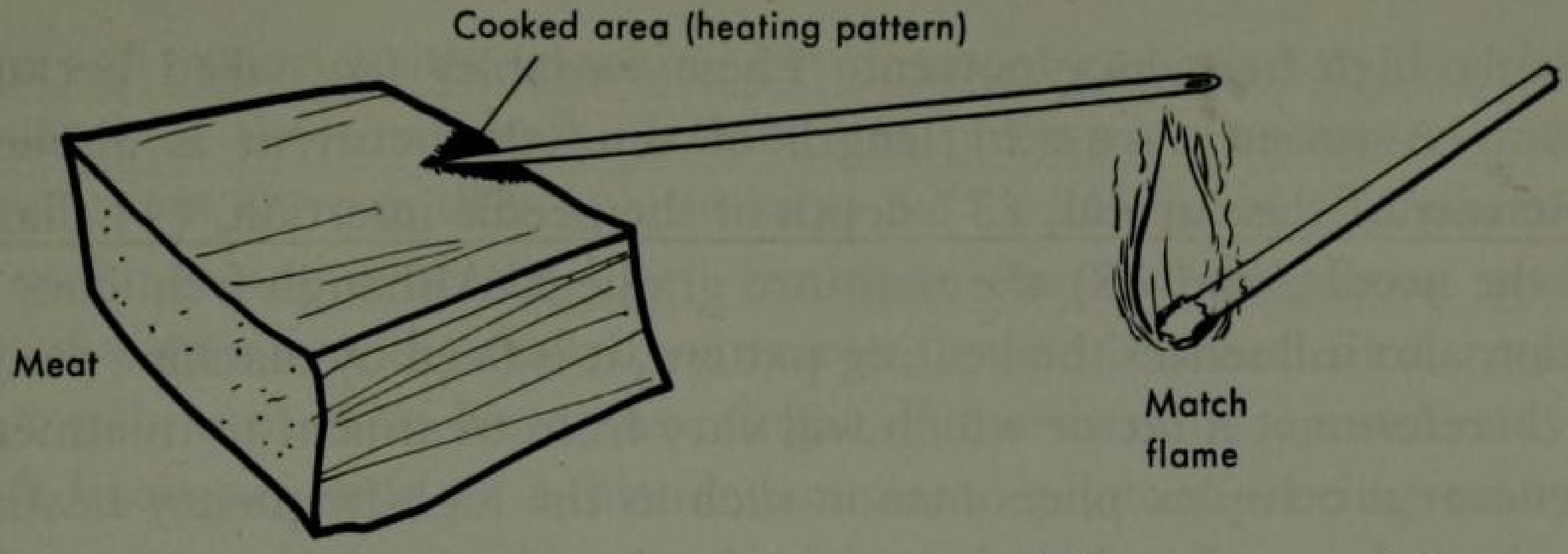


FIGURE 93. *Heating pattern produced by conducted heat.*

needle as shown in Fig. 93. The heat would be greatest at the eye of the needle and least hot at the point. This means that the surface would be the first part to be cooked—hardly a desirable pattern for treating the lower portion of the follicle.

The ideal heating pattern is a somewhat pear-shaped area of action which begins its development at the tip of the high-frequency needle and builds slowly upward around it. The pattern should not reach the surface. In this manner the whole lower section of the follicle and the papilla can be thoroughly cooked before the upper epidermis becomes noticeably affected. It is possible to achieve this ideal heating pattern with high-frequency current, but it cannot be done automatically. There are five major factors which influence the effectiveness of the high-frequency field, and the electrologist must learn to cope with each of them to be able to use the high-frequency needle successfully.

Factors Affecting the Heating Pattern

It is possible to isolate and study separately each of the five factors or "variables" which affect the pattern of heat induced by a needle electrode

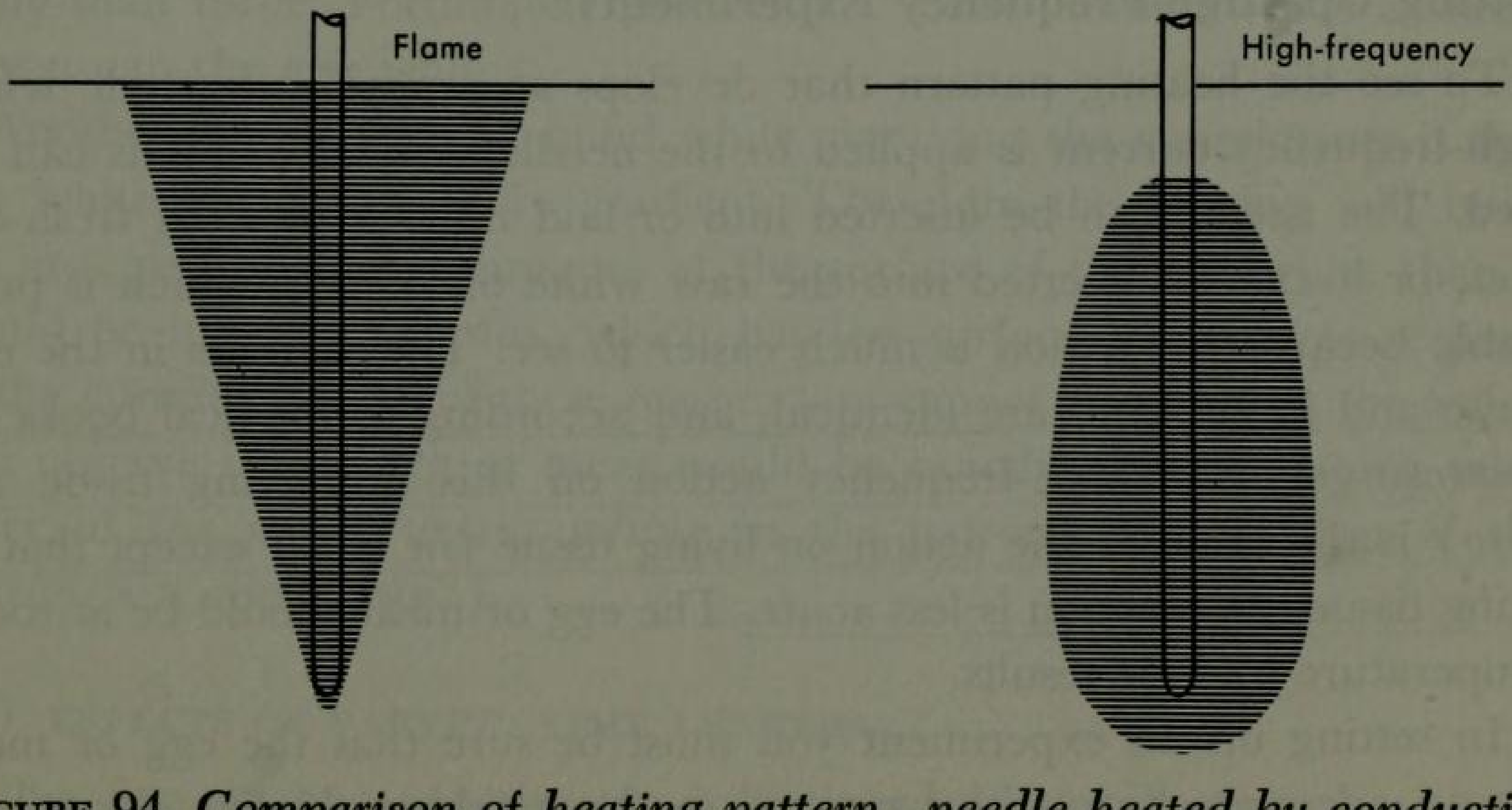


FIGURE 94. *Comparison of heating pattern—needle heated by conduction versus high-frequency current.*

conducting high-frequency current. These variables (so called because each can be varied) are (1) length of time that current is applied, (2) intensity of the current, (3) depth of the needle insertion, (4) diameter of the needle, and (5) the moisture gradient. Although frequency of oscillation also influences the heating pattern, it is fixed by machine design and is therefore not a factor which will vary from treatment to treatment.

Whenever a complex phenomenon such as the high-frequency heating pattern is to be analyzed, it is standard scientific procedure to test for each influencing factor individually, deliberately altering the factor in question, while holding all other factors constant. For example, to see what affect the intensity factor has on the heating pattern it is necessary to run the experiment in such a way that only the intensity of the current is altered. All other variables must be kept the same throughout the tests (same time length, same depth of insertion, etc.). In this manner it is possible to determine exactly what kind of influence the variable in question has on the heating pattern. If any of the other variables are altered in the slightest, the results will not afford a valid interpretation of the tested factor because it will have been distorted by additional factors.

A series of tests, using the scientific method, has been designed for each of the five variables influencing the high-frequency heating pattern. These tests are the basis for establishing all of the principles that need to be considered in weighing the pros and cons of various technics for thermolysis. Because they are of such crucial importance, the tests have been outlined in such a way that the student can duplicate them for herself once she has mastered the use of high-frequency equipment.

Setting Up High-Frequency Experiments

To see the heating pattern that develops at a needle electrode when high-frequency current is applied to the needle, several methods can be used. The needle can be inserted into or laid upon a piece of fresh-cut beef, or it can be inserted into the raw white of an egg, which is preferable because the action is much easier to see. The patterns in the egg white and in the beef are identical, and according to medical books on electrosurgery the high-frequency action on this non-living tissue (*in vitro*) is the same as the action on living tissue (*in vivo*) except that in living tissue the reaction is less acute. The egg or meat should be at room temperature for best results.

In setting up an experiment you must be sure that the egg or meat has an adequate "capacitive return" to the machine. Unlike electrolysis the use of high-frequency does not require a positive electrode; the current will return to the machine by means of radiation through the air. Because of the small bulk of these test pieces it is necessary to lay the meat or set the egg dish upon a large 12″ x 24″ piece of aluminum foil in order to complete the "air" circuit to the high-frequency generator. As an alternative, the experimenter can "ground" the meat or egg simply by touching it with his or her finger, if this is more convenient. If the high-frequency side of a blended current epilator is being used, place the inactive electrode in contact with the meat or egg.

To test your set-up, insert the needle electrode about 3/16″ into the egg white and apply the high-frequency current. Do not use any automatic timing device; set your current manually at a moderate level. If your high-frequency intensity setting is high enough, you will see the egg white cook or coagulate around the needle. High-frequency heating is being produced in the moisture of the egg white, and it is this heat which causes the egg to coagulate. The cooking pattern therefore corresponds roughly to the heating pattern, so that when we talk about one, we are really talking about the other as well. The pattern, as we have said, should start at the tip of the needle and move up to the surface of the egg white. This is how the ideal heating pattern develops.

Since there are great differences between the intensity of high-frequency on various machines it may take a little experimentation to observe the patterns. You must remember that the action produced in the egg at a given machine setting is much more violent than that produced in human tissue at the same setting. First of all, human tissue does not contain as much moisture as the egg white. Furthermore circulation of blood and lymph in living tissue has a cooling effect because it carries the heat away from the treated area. Finally, egg white coagulates more easily than tissue. Fortunately you cannot "blast" human tissue as easily as you can the egg white.

Another fact to keep in mind while observing the experiments is that egg white has no moisture gradient. Therefore the heating will build up in a pattern that is broader at the surface of the egg white than it would be in the epidermis, which has less surface moisture to respond to the current. For all of these reasons you cannot assume that the action you observe in the egg or meat would be exactly like that which takes place *at the same current setting* in the patron's tissues (even if the patron is a good "egg").

(1) EFFECTS OF VARYING TIME LENGTHS

The first of our experiments is designed to demonstrate how time affects the distribution of the heating pattern. It consists simply of observing how the pattern of cooking develops in the egg white as high-frequency current is continually applied to it. Fig. 95 shows how the pattern will develop around a .003″ needle at a 3/16″ depth. The intensity of the current is set relatively low to allow the observer to scrutinize the pattern development carefully. By counting seconds, one can measure the relative rate of development.

By means of this experiment with the time-factor two principles are discernible. First, the *heating pattern starts at the tip and progresses up the shaft of the straight wire needle at a uniform rate.* There is no "instantaneous" heating pattern. Secondly, *the heating pattern expands in width during the time that it is climbing to the surface.* Here again, it takes time for the heating pattern to increase in area.

Another fact to notice is that the greatest cooking occurs around the tip of the needle. The egg itself could not be the cause of this because the egg is equally moist along the entire length of the needle. The high-frequency field is "hottest" at the needle point because (1) the intensity of the field is greatest at the point (producing the "point effect," which we shall discuss in connection with the intensity factor) and (2) the pattern begins at the point, therefore acting on the tissue there for the longest period. This condition is, of course, of great advantage in treating the follicle, only the lower part of which requires treatment.

(2) EFFECTS OF VARYING INTENSITIES

To study the effects of varying intensities, it is necessary to conduct a series of individual tests in which all factors are held constant except the intensity of the current, which will be slightly increased for each subsequent test. Fig. 96 shows the electrode in egg white at varying high-frequency intensities (dial settings) using the same time, same depth and same diameter electrode.

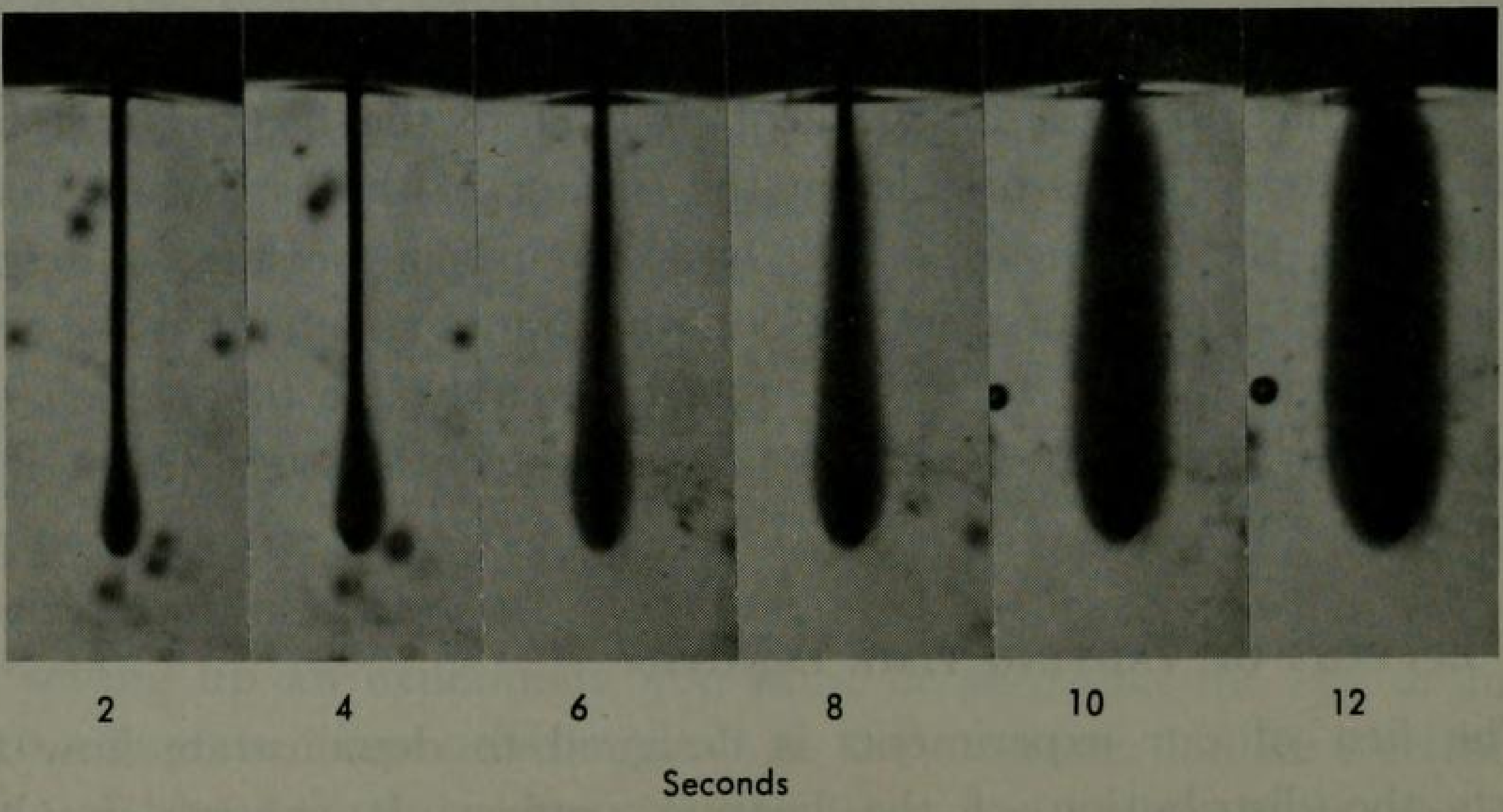


FIGURE 95. *Effect of time on heating pattern.*

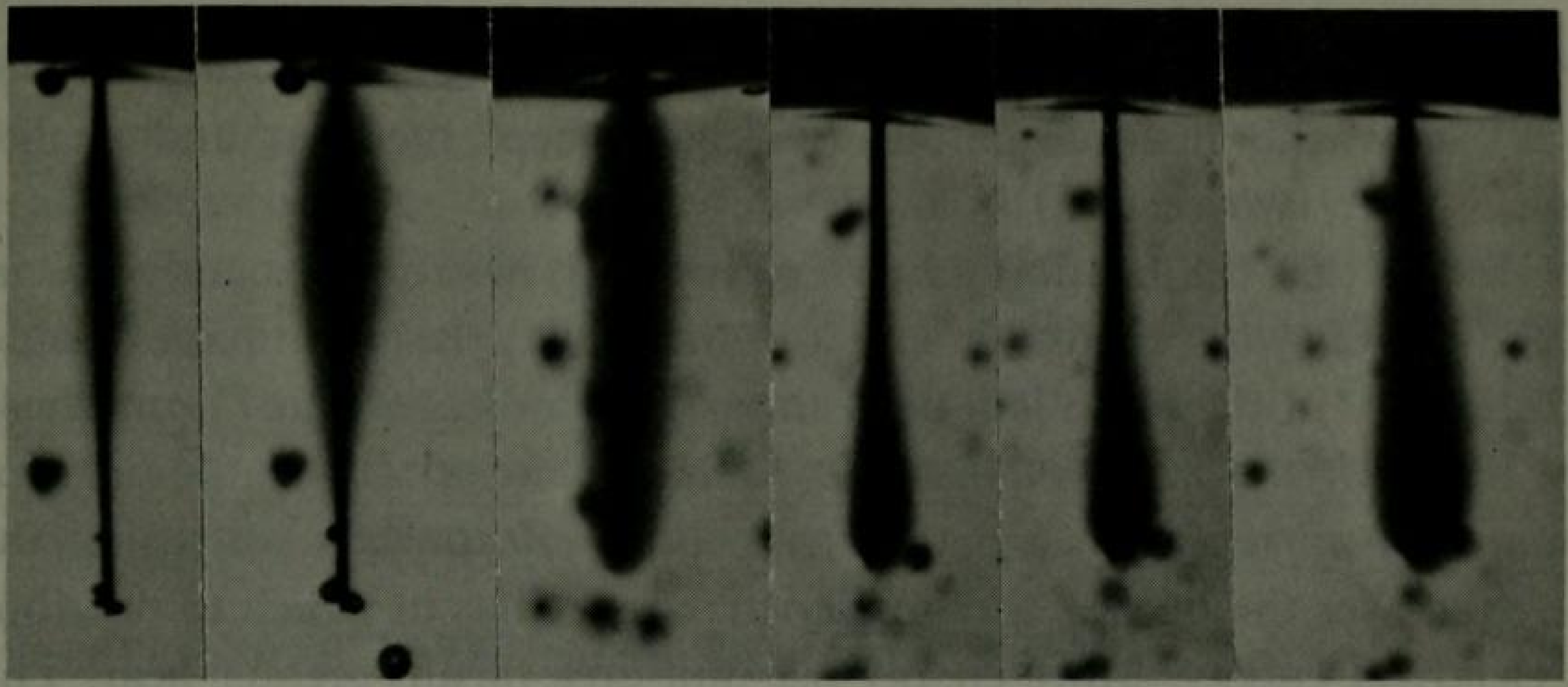


FIGURE 96. *Effect of intensity on heating pattern.*

Observe that with a very low setting the heating action inverts and takes place at the surface of the egg white.* At a little higher setting it just about parallels the length of the needle while at the next higher intensity it starts at the point. Obviously *the amount of current applied will determine the place at which the heating pattern will begin.*

With sufficient current the heating pattern will invariably begin at the tip. High-frequency current is a somewhat peculiar phenomenon in that it does not behave like battery current or the electricity we use in our homes. We know that it likes to leave the conducting wires and radiate into space. It also does something else unusual. *It tends to concentrate on points* (an effect not found in galvanic current). In this respect it is like high voltage or lightning. This tendency to concentrate at points is aptly called the *Point Effect.*†

Our experiment shows that a small intensity current fails to produce sufficient "pressure" to reach the tip; rather, it creates a pattern that builds down from the surface of the egg white. In the human follicle such a pattern would be totally undesirable. Therefore, when using high-frequency either alone or with the blend, *we must use an intensity high enough to start the heating pattern at the point.*

(3) EFFECTS OF VARYING NEEDLE DEPTHS

Testing the effects of varying needle depths requires a series of insertions in the egg white at several levels of depth. Naturally, the identical needle, intensity and duration must be used for each insertion. Fig. 97 shows how the heating pattern looks at deep, medium and shallow depths after two seconds of moderate current.

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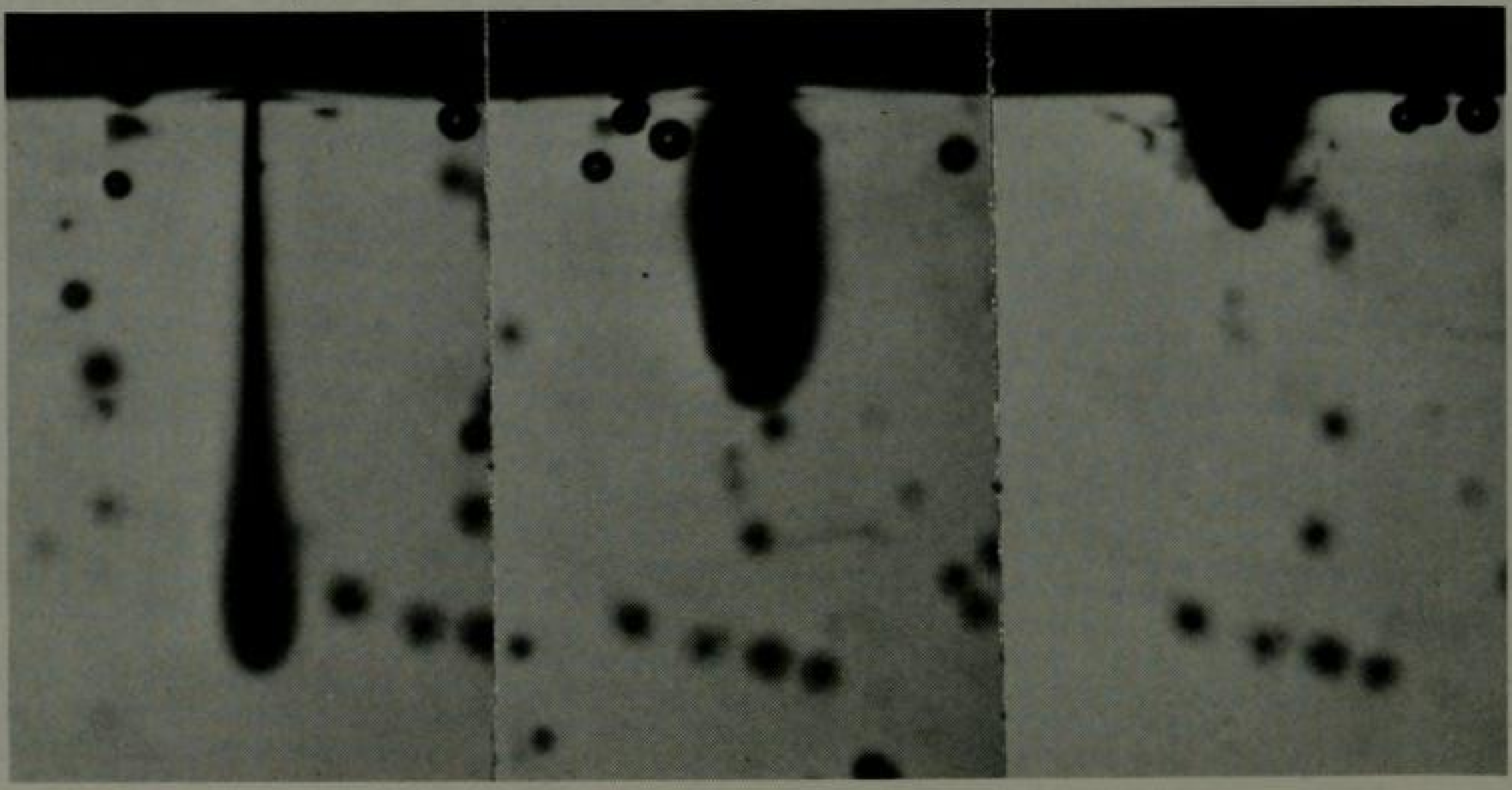
*There is some equipment now sold, which, even at a zero dial setting, will not produce an intensity low enough to cause this surface pattern. This phase of the experiment therefore cannot be produced with this high-intensity equipment.

†For further experiments concerning point concentration of the high-frequency field see Bryan O. Scott, *The Principles and Practice of Diathermy* (Springfield, Illinois, 1957).

Observe that the heating pattern of the deep insertion is barely starting at the end of two seconds while that of the shallow insertion has expanded significantly in the same length of time. This indicates that *the shallower the insertion the more intense the heating pattern will be, for a given amount of current.* We can understand this effect when we realize that the shallower the needle, the smaller the area it has in which to distribute its electrical energy. More energy per unit area means greater heat. Thus the shallower insertions, which involve smaller areas of influence, produce the most concentrated heating effects.

The experiment dramatically demonstrates that *it is necessary to employ uniform depths of insertion when working at a fixed setting on your machine.* If, for instance, you are working with an intensity which is appropriate for medium or deep hairs, it is obvious that you cannot use the same setting for a shallow insertion. Concentrated into a small area of tissue near the surface, the heating pattern would be so intense that it could blister and burn the epidermis to the point that a permanent pit or scar would result. On the other hand, if you made a deep insertion using an intensity that had been set for shallow follicles, the current would be insufficient to destroy the follicle within a reasonable period of time.

Once you have set up your technic for a given area at a given intensity setting, it is better to keep the depth of insertion reasonably similar for every hair. If the depth of insertion is kept the same as that of the average hair in anagen, the results will be much more successful than they would be if you were to attempt to adjust to a new depth for each



2 seconds 2 seconds 2 seconds

FIGURE 97. *Pattern differences at various depths.*

new hair. For this reason all hair of a certain type in a specific area should be treated as a group, before you adjust to a new depth for treating another type in the same area. (Exception: Users of the "flash" method can adjust their controls so that varying depths of hairs can be exposed to proportionate numbers of split-second applications, thereby permitting treatment of different types of hair consecutively. For example, one tap on the footswitch would release shallow hair and two taps would release medium depth hair.)

(4) EFFECTS OF VARYING ELECTRODE DIAMETERS

By carefully employing the identical depth, current intensity and time for each test, we can compare differences in heating patterns among needles of varying diameters. Fig. 98 illustrates the differences which occur among needles of three different thicknesses.

Observe that the heating pattern is greater around the two smaller needles, the smallest having the largest pattern of the three. *The smaller the diameter of the needle, the hotter its heating pattern will be if all other factors are held constant.* The principle responsible for this effect is the same one we found to be operative in the depth factor. That is, whenever the field of influence of a given amount of current is concentrated into a small area, its effect on the tissue is proportionately increased.

In the case of the needle diameters, we might liken this principle to the differences in effect achieved by varying the nozzle openings of a garden hose. If we equate the high frequency field with the pattern of water leaving the nozzle, a large diameter needle would act like a nozzle that is adjusted for a wide cone of spray. A nozzle adjusted in this manner will distribute its water supply over a large area of ground, thus

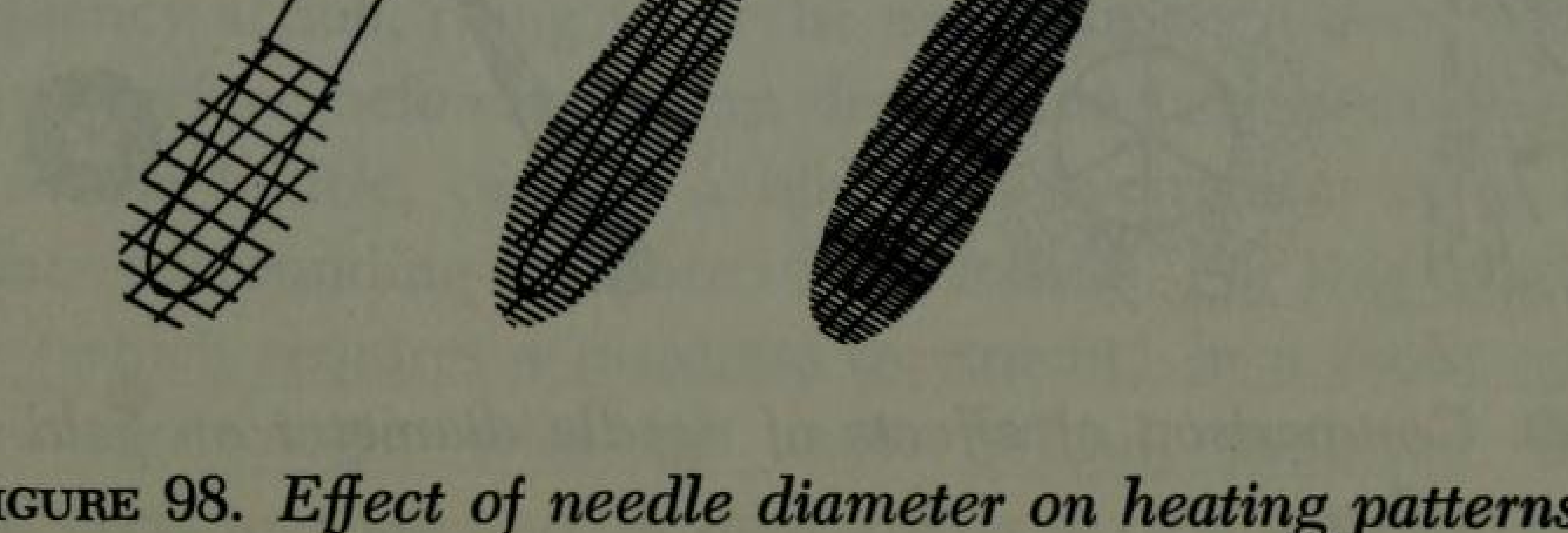


FIGURE 98. *Effect of needle diameter on heating patterns.*

reducing the force of the water at any given point of impact. Compare this with the effect produced by a nozzle adjusted to direct the *same amount* of water in a narrow stream. Its target area may be smaller but its impact is much greater. In a similar manner the narrow needle intensifies the field action (heating) of the current. This is why the smaller diameter needle is the "hotter" one, so to speak, all other factors being equal.

(5) EFFECTS OF THE MOISTURE GRADIENT OF SKIN

Having explored all of the factors which will affect the heating pattern induced by high-frequency current in a homogenous substance (egg white), we must now consider the human moisture gradient itself. The "moisture gradient," as it was explained at some length in the preceding chapter, represents the gradual differentiation in moisture content down through the various layers of the epidermis. As with galvanic current, this gradient is of great advantage to the high-frequency operator, who wants to limit the action of the needle to the lower half of the follicle as much as possible, both to avoid blistering of the epidermis and to keep heat from over-stimulating nerve endings higher in the follicle area.

Unfortunately, there is no way to reproduce artificially the type of heating pattern that the high-frequency field creates in an epidermal moisture gradient. However, since we do have theoretical knowledge of the effects of moisture on the current, it is possible for us to deduce with confidence the nature of the pattern in the skin. In the egg white experiments, the egg was equally wet or moist along the entire needle length, so that the pattern we saw resulted from the action of high-frequency in a zero moisture gradient (no differentiation). To visualize the pattern as it would appear in human tissue, we need only consider how our egg white pattern would be altered by the gradation of moisture present in the follicle. See Fig. 100.

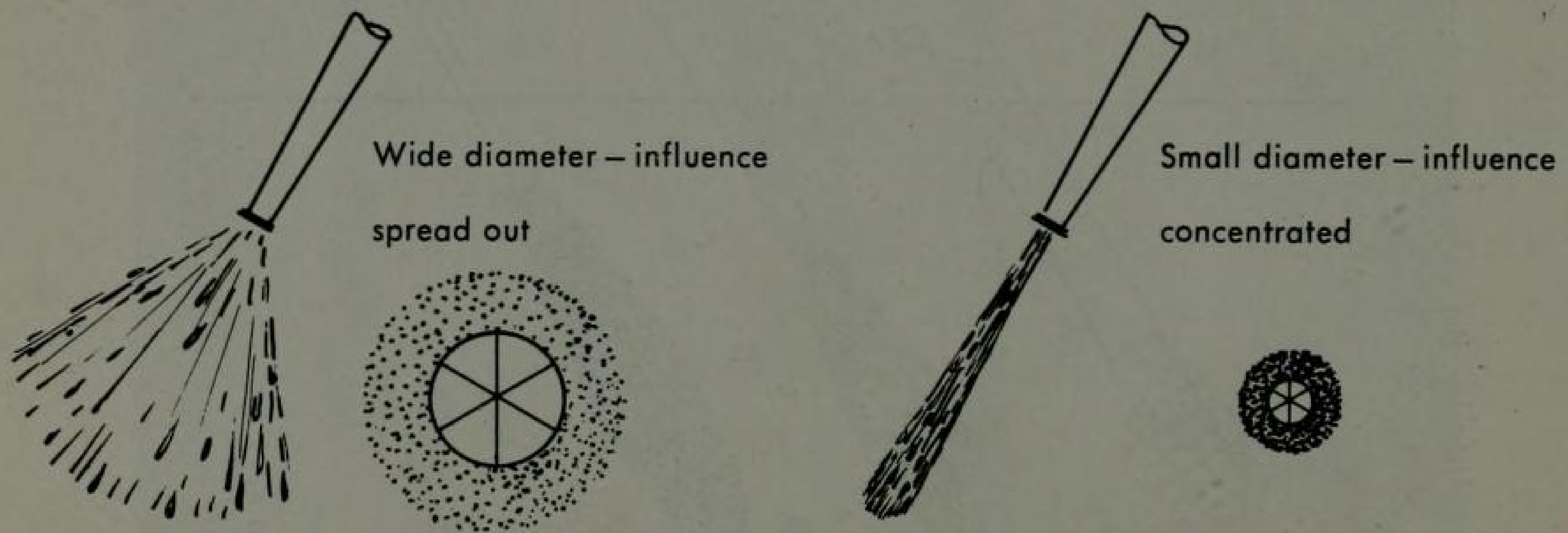


FIGURE 99. *Comparison of effects of needle diameter on field intensity—same current flow.*

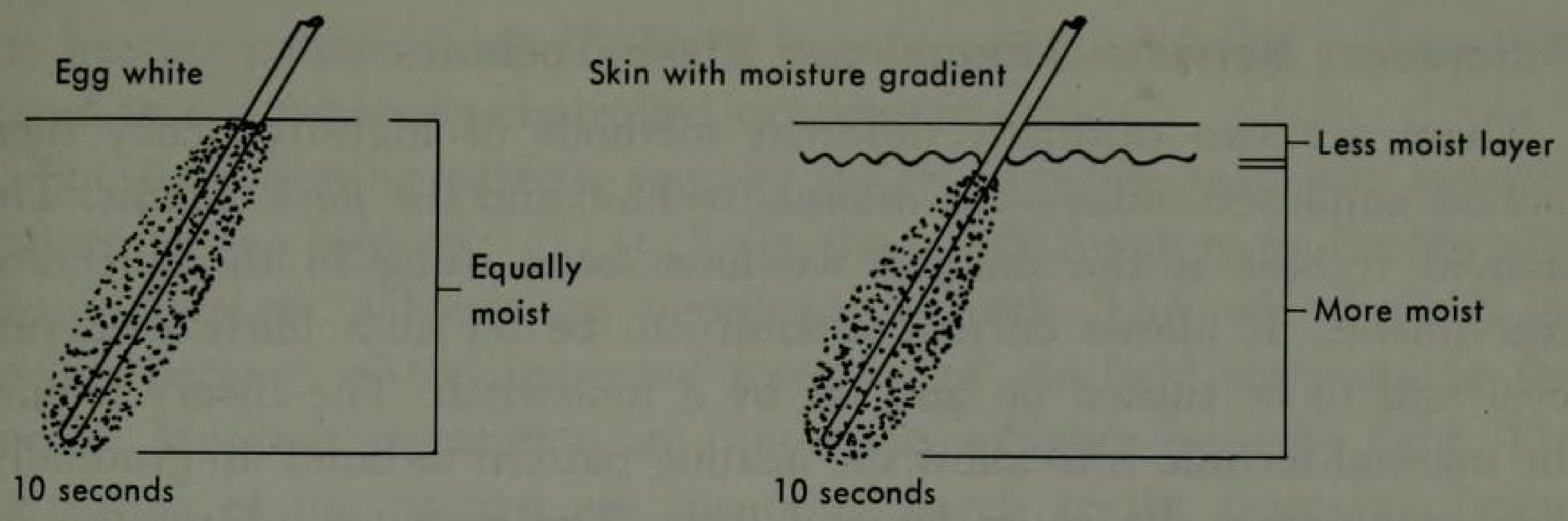


FIGURE 100. *Comparison of heating patterns in egg white and skin layers.*

Although the actual pattern within the follicle cannot be directly viewed, it is still possible to see the dramatic differences that varying moisture content can produce. Simply take a fresh piece of beef and lay the high-frequency needle on various parts of its surface, taking care to maintain the same intensity and applying the current to each place for the same length of time. You will find that if you lay the needle on a fresh-cut wet section you will get a wide pattern; on a darkened, dry area of the meat you will get a narrower pattern. Since biologists are universally agreed that a moisture gradation does exist in the skin, it follows that the heating pattern must be considerably diminished near the dryer surface, as shown in the above figure.

Awareness of the moisture gradient in the skin of the patron will enable you to appreciate in practice why different areas of the same patron will vary in their reaction to treatment as well as why different patrons ✓ will vary in treatment reaction. Different areas of the body have different moisture gradients. The moisture gradient of the same patron will vary from time to time according to the season of the year, diet, degree of health, internal medication, and home skin care.

X If the surface of the skin is very dry, i.e., lacking moisture, almost no high-frequency action will take place in the upper epidermis even though ample action will occur in the lower half of the follicle. This, of course, is the kind of heating pattern we want; dry skins give us no trouble. On the other hand, very moist epidermal areas have little moisture difference between the lower and top half of the follicle. This means that the pattern of high-frequency action, rising from the needle tip as it does, may reach the epidermal surface before sufficient destruction has taken place in the lower half of the follicle, causing a blistering overtreatment of the epi- X dermal surface surrounding the pore of the follicle. For this reason deep, coarse hair (which requires a maximal treatment) in a moist epidermis presents the electrologist with her most difficult problem. Different technics will vary, we shall find, in their ability to deal with this problem.

Differences Between Manual and Flash Technics

There are two distinctly different methods of high-frequency thermolysis employed today—the *manual* technic and the *flash* technic. The manual technic is the method we have been using in the foregoing experiments. It allows current intensity to be set at a fairly moderate level and to be turned on and off by a footswitch. The theory behind the manual technic is to allow the heating pattern to build up gradually, thus coagulating the entire lower follicle. The operator adjusts the intensity of the current to the highest level that can be comfortably tolerated by the patron.

In contrast, the flash (automatically timed) technic uses an automatic timing device which permits the needle to emit a flash of very high-intensity current for just a fraction of a second. Each depression of the footswitch produces another flash of current in the follicle. The purpose of this method is to desiccate the follicle so quickly that the patron's nerves will not respond to it, thus desiccating tissue in a burst of intense heat too short-lived to be painful. The flash method is the most popular technic in use by electrologists today. It has, however, a serious disadvantage in its limited cooking range. The flash method, because it is timed for only fractions of a second, theoretically makes up for the loss of time by the high intensity of its current, which creates a very high heat around the needle. Its heating pattern is nevertheless substantially slimmer than that produced by manually-controlled applications. Using the white of an egg again, it is possible to compare the patterns of the two technics. Fig. 101.

In conducting this experiment you will note that the affected area becomes extremely hot because of the high intensity of the current. Moisture quickly converts into water vapor, which pops and sizzles audibly. (This violent reaction will also occur in the follicle due to the rapid creation of steam.) In spite of the intensity of the heat, however,

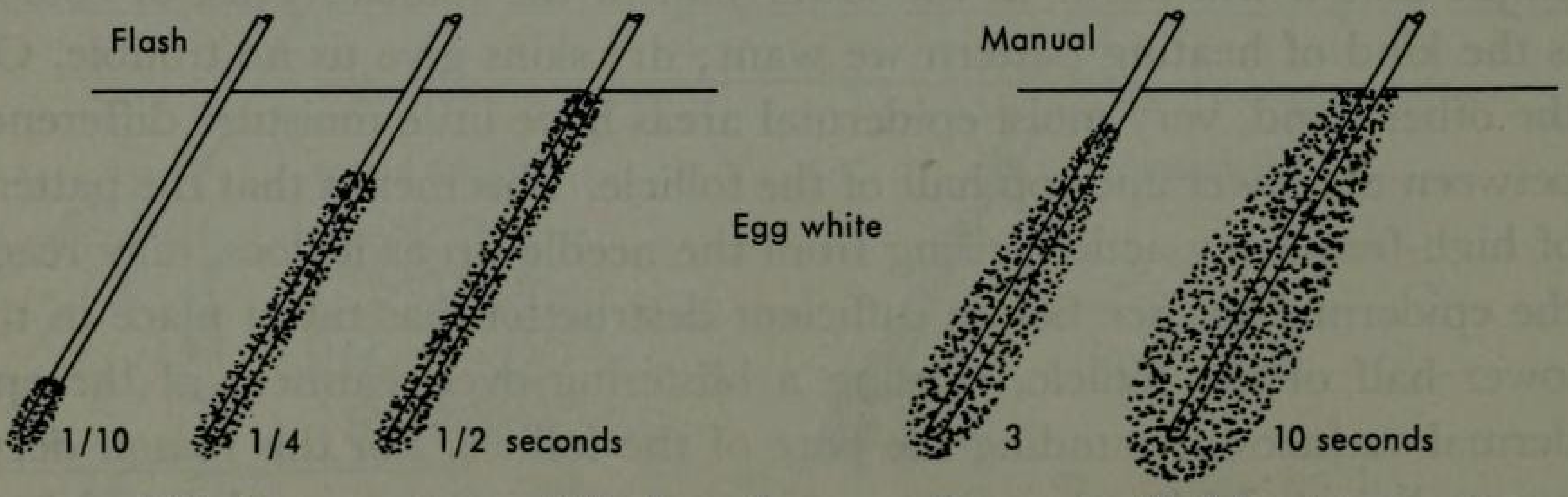


FIGURE 101. *Comparison of flash and manually controlled heating patterns at typical treatment settings.*

the heating pattern is *very narrow* in comparison with the pattern produced in our manually-controlled experiment.

The flash heating pattern actually differs from the manually induced pattern in two respects: (1) it climbs the needle much more rapidly and (2) it does not achieve any significant breadth. The rate of climb increases because of the increased intensity of the field surrounding the needle. Moisture responds more quickly to a higher intensity field. The narrowing of the pattern, on the other hand, results from insufficient time for heat to penetrate the tissue. *The shorter the time, the narrower the heating pattern will be; heat takes time to penetrate.*

The narrowness of the flash pattern obviously reduces the extent of destruction produced by the current. Kovacs has observed this effect in *Electrotherapy and Light Therapy:*

> Experiments demonstrate that the depth of destruction under the active electrode depends on the strength as well as on the duration of current flow and that a heavy current flowing for a short time does not coagulate so deeply as a lighter current flowing for a longer period. (p. 368)

In applying the principle to electrosurgery, Kovacs is more concerned with "depth" than "width," but the terms are interchangeable so far as the principle is concerned. The flash method with its shorter current time simply is not able to destroy the amount of tissue that the manual method can with its longer, lower current. This limiting effect of the duration of heat on the depth of penetration can be appreciated through the analogy of cooking. In broiling a two-inch steak, it is easy to leave the center raw even though the outside has been blackened. The heat in this case requires considerable time to penetrate to the middle area, which is fairly deep. On the other hand, a half-inch steak is easily over-cooked at the center because the heat does not have so far to travel and therefore takes much less time to reach the center.

Flash vs. Manual Patterns in the Follicle

To appreciate the relative differences in effects which will be produced by the two high-frequency methods, we can graphically superimpose their heating patterns on the follicles of average terminal hairs at various stages of anagen. Fig. 102 illustrates the way in which a typically manually-produced heating pattern would be distributed in the follicle.

Under normal treatment conditions the electrologist is unable to tell exactly what stage of the hair replacement cycle a hair is in, so she makes an insertion to a depth which she judges to be the level of the papilla of a hair in later anagen. This fact has been taken into considera-

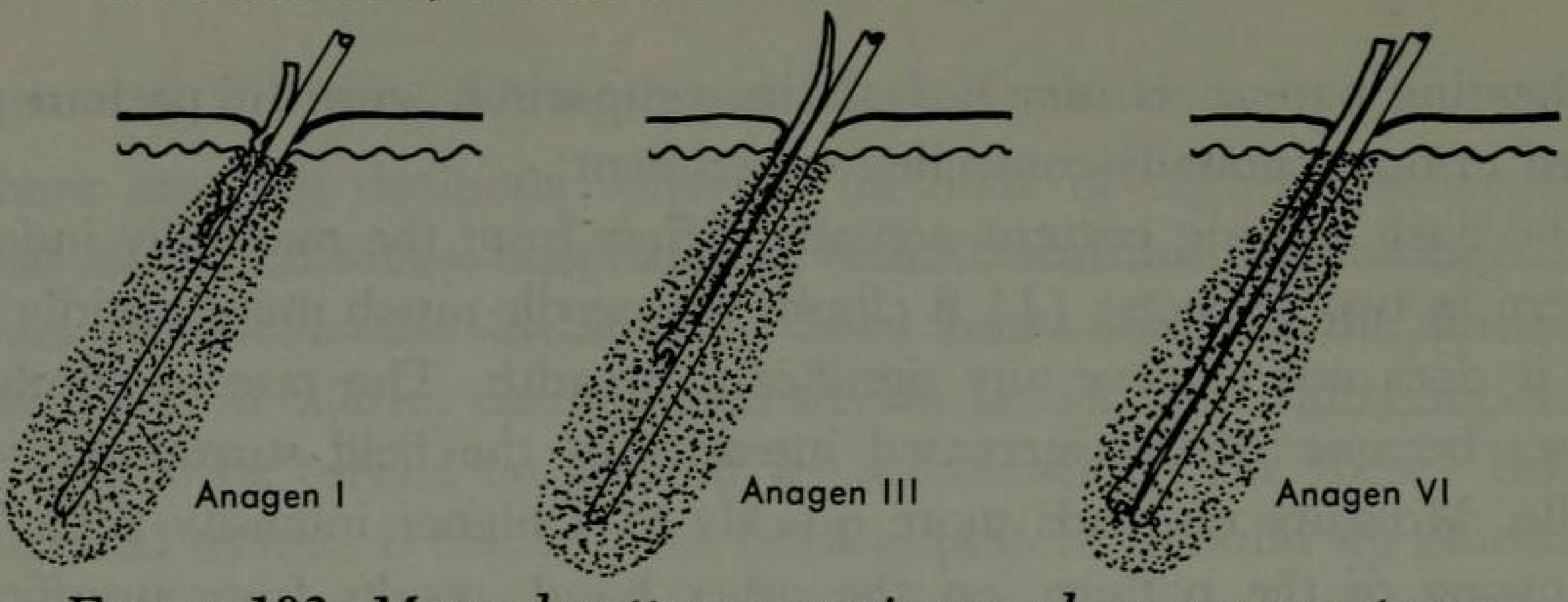


FIGURE 102. *Manual pattern superimposed on anagen stages.*

tion in the illustration; all needle depths are uniform. As the diagram indicates, the broad width of coagulation around the needle due to the low-intensity manual technic will do a fairly good job of destroying the future hair germ cells in the outer sheath as well as the dermal papilla now active. If the epidermis is normal or dry in moisture content the surface will not be overtreated. If it is on the moist, wet side the heating pattern may reach the surface of a deep, firmly rooted hair before the lower portion is thoroughly coagulated. This can be avoided in some cases by using tapered needles, a factor which will be discussed in subsequent chapters. Nevertheless, this overtreatment problem is the major shortcoming of either type of high-frequency technic, although the manual technic is by far the most effective of the two.

In Fig. 103 we have superimposed the flash pattern on the same follicles on which the manual pattern was shown. It can be seen that the narrow pattern is unable in this instance to heat the entire tissue structure of the lower follicle. Part of the problem stems from the fact that the needle must share space in the follicle with the hair, which forces the needle over to one side of the follicle "well." The needle's narrow heating pattern is therefore positioned off-center, and the whole section which lies on the "shadow" side of the hair remains untouched. (The hair itself contains little moisture and would respond very weakly to the field.) Fig. 104 provides a cross-sectioned comparison of the flash and manual heating patterns in the follicle, showing how the flash pattern misses an important portion of the follicle.

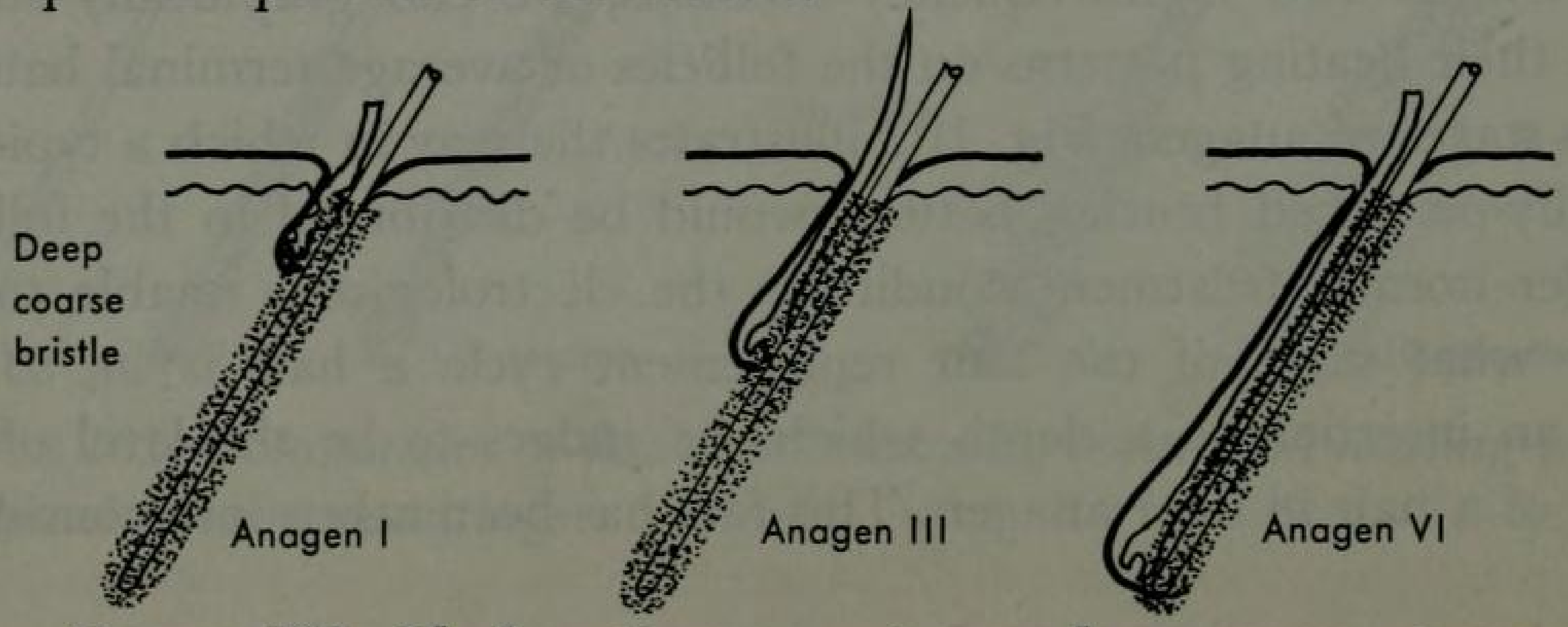


FIGURE 103. *Flash pattern superimposed on anagen stages.*

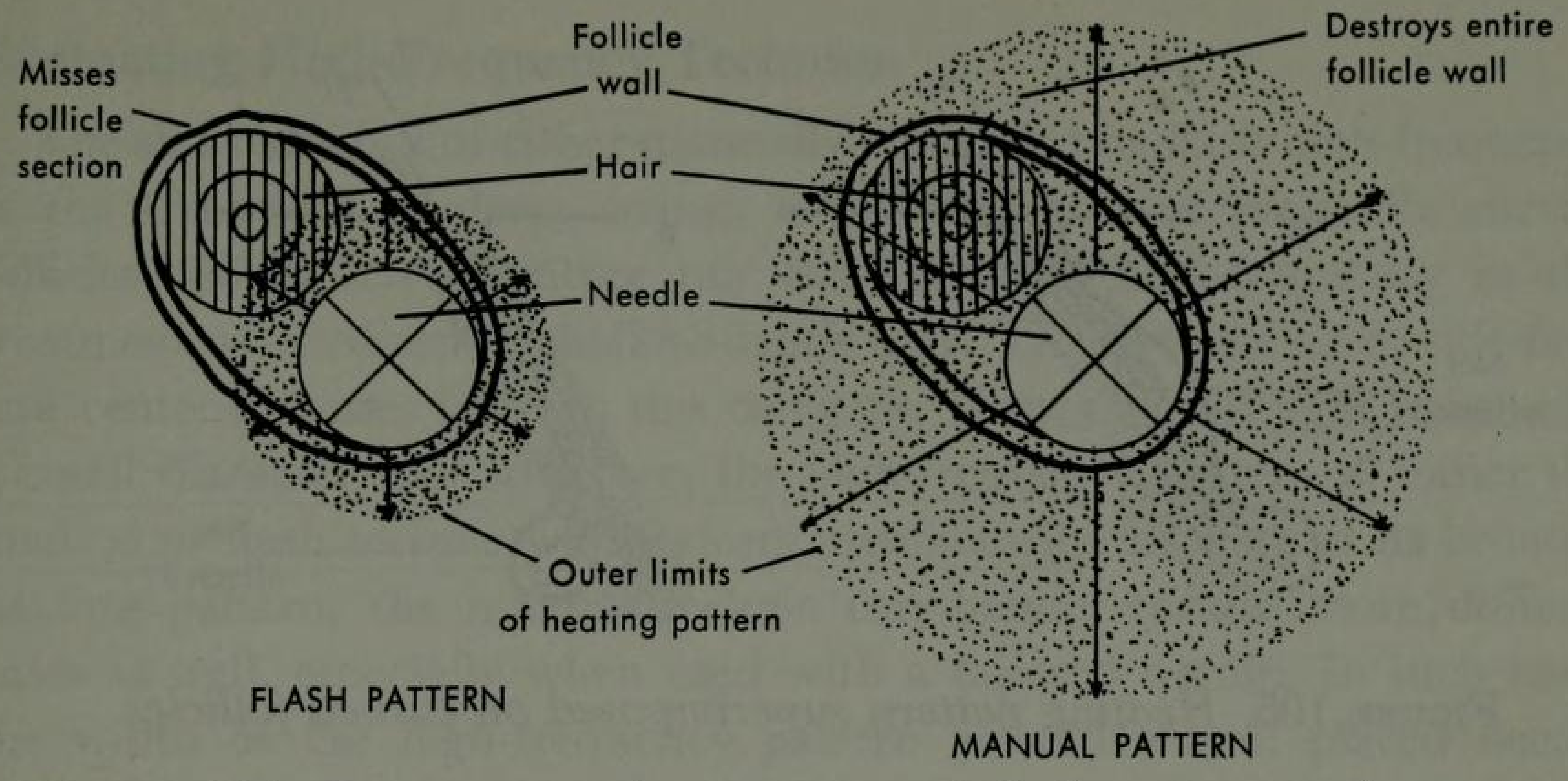


FIGURE 104. *Cross-sectional comparison of flash and manual patterns.*

Most users of the flash technic find that a series of flashes or "taps" sometimes helps in cooking the medium-to-shallow hairs loose. This is because the heating pattern will expand somewhat with an additional tap or two. This increase in pattern is small, however, and expansion will not continue to occur after the first two or three flashes because of the cooling effect of the circulatory system which occurs between flashes. Narrowness of pattern makes treating certain deeper, thicker hairs especially difficult.

Increasing the intensity of the flash is of little assistance to the flash operator. Because a higher current would mean a faster climb of the heating pattern, a current powerful enough to blast out all vital tissue in a deeper follicle will carry right up to the surface, both blistering the skin and exceeding the patron's pain tolerance. Hence, the electrologist is forced in many cases to undertreat the deeper follicles and tweeze the hairs forcibly, in the hope that she can catch the replacement hair in early anagen, when it is growing at a shallower depth. This, unfortunately, means a high regrowth rate—and an unhappy patron.

The Problem of Using High-Frequency on Curved Follicles

Another major problem for either of the high-frequency technics, manual or flash, is the "curved" follicle. Any hair which is naturally curly or "kinky" grows from a follicle which has a natural curve to it. The degree of curl in the hair is directly proportionate to the amount of curvature in the follicle (which seems to affect the flatness of the hair). The follicle of wavy or curly hair has a simple curve, whereas that of kinky hair tends to hook back in an "S" curve. These follicle shapes make accurate needle-insertions very difficult.

Fig. 105 shows how the high-frequency needle tends to miss the vital parts of the follicle. So many variations exist with the curved follicle

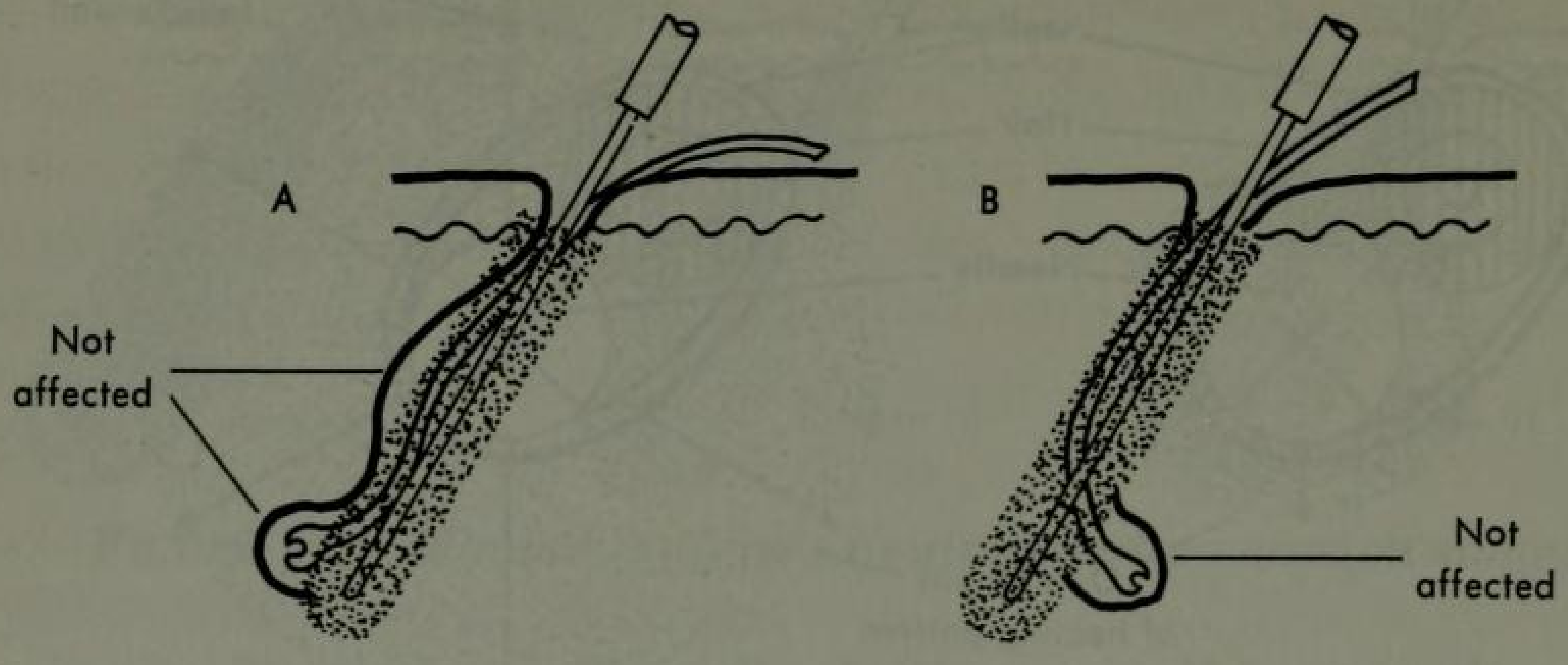


Figure 105. *Heating pattern superimposed on curved follicles.*

that no sketch could do more than suggest the problem. The needle point sharpness, the softness of the follicle wall, the strength of the hair root in resisting the straightening tendency of the needle, the guess of the direction and angle of inclination are all factors in determining the proximity of the needle to the vital hair germ cells and dermal papilla.

It should be obvious that a narrow heating pattern would be less effective than a broad pattern in the curved follicle. Even a broad pattern would be less effective than the galvanic electrolysis process on this type of hair. The sodium hydroxide produced in galvanic electrolysis, being a fluid, is capable of reaching areas outside the high-frequency field and therefore gives better results with the curved follicle problem. Many experienced electrologists have recognized this and therefore use single or multiple needle galvanic on these cases. Galvanic current fills a definite need in our work and is the basis of the blended-current method we shall discuss in Chapter X.

"Distorted" Follicles

Naturally curved follicles associated with curly or kinky hairs should not be confused with the so-called "distorted" follicles, which have often been invoked by operators as the cause of failure when thermolysis is unable to epilate certain hairs. It has been a long-standing practice among some electrologists, when they are unable to release a hair by current alone, to tell the patron that her hairs have to be tweezed because her follicles are "distorted" from many years of tweezing. There is no evidence to bear out this contention. Follicles that are truly distorted are seldom found, and when they do occur, they appear only around scar tissue, either where a deep wound has been inflicted or where, in some cases, severe acne or ingrown-hair scarring exists.

Evaluating High-Frequency Technics

The shortcomings of either manually-controlled or flash high-frequency in the treatment of deep, coarse, bulbous hair or of markedly curved follicles should not prejudice our evaluation of high-frequency in the treatment of medium-to-shallow-depth hair. The average arm, side-face and center-lip cases fall into this category. If they are straight hairs with a small diameter root structure, the high-frequency pattern of either the manual or flash technic will perform satisfactorily. Because of its broader heating pattern, the manual technic can handle certain more difficult cases as well, especially when used with a tapered needle. In such cases the width of the high-frequency pattern around a well placed needle electrode is ample to effect the desired destruction of the dermal papilla as well as hair germ cells in the outer root sheath.

Thermolysis Equipment

Having observed the general principles operative at the high-frequency needle, we are now in a position to acquaint ourselves with the high-frequency epilator itself. Normally the high-frequency epilator is regulated by an intensity control, which acts as a rheostat, and an adjustable timing device for automatically controlling the interval for which the high-frequency will flow. A switch of some type will cut out the timer so that the epilator may be manually controlled by a footswitch if desired.

If the student will think of the intensity control as a valve on a gas stove or the temperature control on the oven, she will appreciate how the heat can be raised by turning the knob (usually clockwise). The numbers on the dial of a high-frequency epilator may read 0 to 10, 0 to 100 or some other calibration but these have no special meaning in themselves, since they simply represent arbitrary units of measure. They are meant to be used only as a guide to relative intensity.

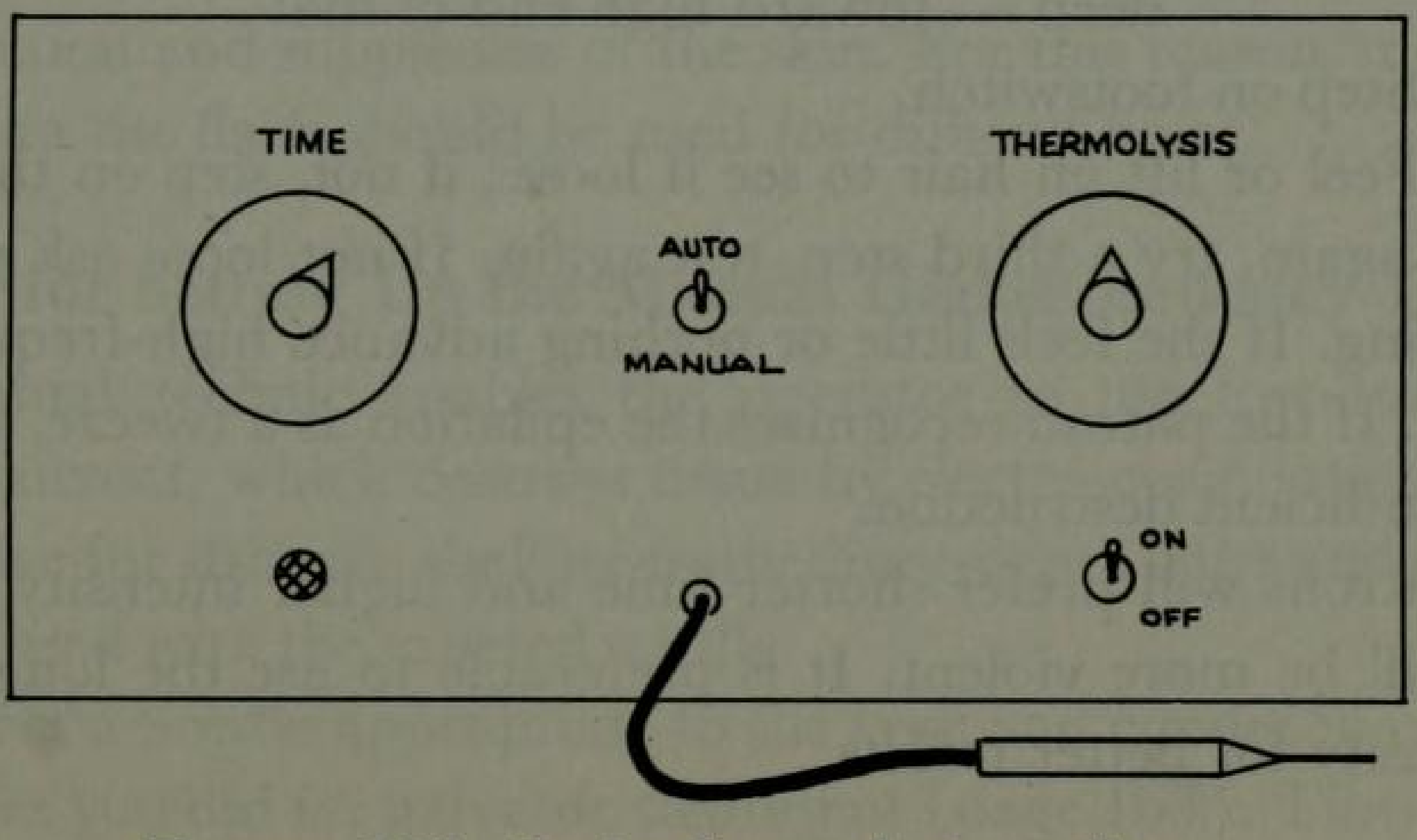


FIGURE 106. *Basic thermolysis epilator.*

Because the practice of electrology is truly an art, not a science, meters calibrated for accurate indication of internal circuit flow or power would be of little assistance other than to assure uniform machine output. The electrologist quickly learns not to gauge intensity by the dial but by the unique physical characteristics of the patron.

The Timer Control may adjust from 1/20 to 1 second or 1/10 to 2 seconds but here again the dial numbers are usually arbitrary. At any rate, exact readings in fractions of a second would be unreliable since line voltage fluctuations, heating and aging of components will all cause variations in actual time. Nor is it necessary that such settings be accurate.

It cannot be stated too strongly that no meter or automatic device is going to replace judgment on the part of the electrologist. When dealing with the human being, we have to deal with so many variations (as we have discussed elsewhere) that it is illogical to assume that any automatic arrangement will be able entirely to replace thinking or experience on the part of the electrologist.

Procedure for Setting Up the "Flash" High-Frequency Technic

The flash technic operates at high intensity, causing a narrow pattern of electro-desiccation. It is most efficient when used on lanugo and straight, medium-depth hairs.

Turn epilator on, let warm up 30 seconds before stepping on footswitch.

Step 1. Cut timer "in" or switch to "automatic."

Step 2. Insert needle to proper depth (Chapters III and VIII).

Step 3. Set timer for about ½ second (see footnote*).

Step 4. Set high-frequency intensity based upon depth of insertion as follows:

shallow — toward low end of dial
medium — toward middle of dial
deep — toward high end of dial

Step 5. Step on footswitch.

Step 6. Feel or lift on hair to see if loose; if not, step on the footswitch again, test again, try a third step, test again. If not loose ask patron if she feels anything. If she feels little or nothing advance high-frequency or advance time. If the patron recognizes the epilation as a tweeze, you have not produced sufficient destruction.

Some patrons will prefer shorter time and higher intensity but the skin reaction will be more violent. It is preferable to use the longer time and lower intensity for better results.

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*Manufacturer's instruction booklet should give suggestions for settings.

You must realize that in the "flash" technic we are trying to destroy the appropriate tissue faster than the nerves can respond to high-frequency action. Patrons' nerve responses will vary greatly. If, for example, ½ second is all that a patron's nerves will tolerate, and any more high-frequency will be too violent to the skin, then you should use less high-frequency and two or three ½ second flashes on the timer for each hair.

You should have little trouble reaching an appropriate intensity on the medium and shallow hair with normal skin. The greatest problem develops with deep, coarse hair in moist skin because the surface breaks down or blanches before the hair is loosened. There are two alternatives: either tweeze the hair or try the manual technic if your equipment will work in that range. If you tweeze, the follicle will regrow another hair in later weeks.

Treating the hair in the first stages of anagen, is more apt to be successful with the flash method. This is especially true of curly or kinky hair. Almost every practicing electrologist is aware that when a curly flat hair is removed from a curved follicle it is replaced by a small-diameter hair which is almost straight when it first emerges from the follicle. Early anagen hair are *less deep* and have not developed to their full thickness and flatness. One very good reason for treating regrowth as it is emerging from the follicle is the fact that follicles which will eventually be curved are still relatively small and straight at this stage. A month or two later the new hair will look just like its forerunner and probably resist destruction again. The need for treating regrowth as it emerges from the follicle is the most important reason for keeping your patron on a schedule.

Scabs and red spots a week after a treatment are signs of overtreatment, unless preceded by pustules and infection caused by faulty home treatment. (See Chapter XII for further details.) Even if no overtreatment signs occur, there is an inherent danger in re-treating an area month after month, year after year with a flash method that is obviously inadequate for the type of growth present. Eventually such repetition will lead to an alteration in pigmentation and suppleness of the skin. For this reason, more effective methods than the flash should be used for difficult hairs.

Procedure for Setting Up the Manual High-Frequency Technic

The manual technic enables the operator to use low-intensity high-frequency current, which destroys tissue by electro-coagulation. This technic is effective for straight, shallow-to-medium-depth hairs and certain deep hairs when used with the tapered needle.

First, select a needle appropriate to the type and condition of the hair to be treated, as you did for galvanic treatment (page 163). Turn epilator on, let warm up for 30 seconds before stepping on footswitch.

Step 1. Cut timer "out" or switch to "manual."

Step 2. With high-frequency intensity at zero, insert needle to proper depth (Chapters III and VIII).

Step 3. Step on footswitch, advance the high-frequency control slowly. Advise the patron to tell you when she feels the current slightly. Leave dial at the point at which she reports a mild sensation. (Never switch on the high-frequency current until after the needle is inserted.)

Step 4. Continue for not more than 20 seconds, feeling or lifting on the hair with tweezers in the left hand to test for looseness. Only if you are inserting and epilating with the same hand must you stop the current, remove the needle and check the looseness of the hair. (Always turn off current before removing needle.)

Step 5. Continue current until the hair releases. The total time for applying current should not exceed 20 seconds. If the hair does not release in that time, tweeze it, since any more current would be harmful to the surface of the skin. Proceed to a similar hair just far enough away that the heating pattern will not "bridge," advance high-frequency control slightly to bring it to a more effective level, and test again for hair-release as in step 4. The hair should come loose well within 20 seconds.

Step 6. Now go on to the next hair. Keep verbal contact with the patron as you continue to raise the current. Hair by hair you must raise the intensity until you have reached the patron's pain or skin tolerance level. That will be your "working point."

Experience has shown that if a hair does not epilate in 20 seconds either the angle of insertion is wrong or insufficient intensity is being used. Insufficient intensity would produce an inverse pattern of heat, as discussed above (see Fig. 96 on page 183). For this reason it is best to set up current considerably for another similar hair, if 20 seconds of current has failed to epilate the first one. Remember, if the patron *feels* your epilation, you have not applied the current long enough to destroy the tissue that could produce future hair growth in that follicle.

The electrologist may feel traction but the patron should not recognize the epilation as a tweeze.

As you gain experience with your epilator you will find that you need not start so low in intensity and can therefore arrive at the proper setting in fewer steps. However, do not start out on a new patron or a new area on the same patron at the same setting at which you finished the previous treatment. Always start low and build up. Tell your patron the more heat she can take, the faster you can go. Keep advancing slowly. At some point based on the pain threshold or skin tolerance level you will reach the optimum setting, which is the "working point."

The "Working Point"

At the "working point" you will have achieved the shortest epilation time at the highest setting the patron can *comfortably* tolerate. The intensity should not reach the first-clenching, toe-twisting stage, but should be kept at that point where the patron is content to take the treatment. We reach the "working point" by getting the patron's cooperation, by acquainting her with what we are trying to accomplish, by letting her know that she alone determines our speed. If the action of the needle is too painful, she should be able to request that we lower the intensity and go slower. In effect the patron determines the technic speed (of the manual technic and the "blend").

The patron's threshold of pain, as pointed out in Chapter IV, will rise as work is continued in a given area, therefore allowing for a higher "working point" as you progress. If the patron has an unusually low threshold, recommend that she have her doctor provide some form of medication. (Care must be taken not to overtreat when there is no pain factor to guide you.)

The "working point" in the low intensity manual technic is usually reached in the range between 3 to 20 seconds. The reason for this variation is due mostly to varying depths of insertion. The following table indicates average time for various types of hair:

10 – 20 seconds — very deep hair (scalp, man's beard).

10 – 15 seconds — deep (woman's chin, under chin, bristles on side face).

6 – 10 seconds — medium depth (woman's chin, neck, back of neck, hairline).

3 – 5 seconds — shallow lanugo (cheeks, lip, neckline and hairline fringe).

Naturally the patron's pain threshold will vary, but most patrons can comfortably tolerate the intensities which make possible the ranges shown above.

Summary

The superiority of the manual technic over the "flash" method is obvious. Experiments you can perform yourself clearly demonstrate that the shorter the time you apply the high-frequency, the narrower its pattern of heat. It logically follows that any technic which employs short bursts of high-intensity current is apt to be inefficient. Unless the needle is "right on target," the narrow flash pattern can completely miss the vital structures of the follicle. And, as we have seen, accuracy of insertion is very difficult to achieve, considering all of the variables involved in growth patterns. Too often insertions miss the mark.

Even the manual technic, however, has its weaknesses. We have seen how a broad pattern of heat can still miss the papilla and the outer root sheath of truly distorted or curved follicles. High-frequency also presents the problem of overtreating the skin surface when trying to produce adequate action at the base of the deeper, coarser hairs. The "blend" technic has been designed to handle such problems with greater efficiency. Skills you have acquired from this chapter are directly applicable to the blend technic, to which we turn next.

Chapter X

The Blend

The "blend" or "dual action" method is a technic which entails the simultaneous use of the galvanic and low-intensity high-frequency currents. To avoid the inherent short-comings of either the galvanic or the high-frequency technics, the blend method has in effect combined the thoroughness of the one technic with the swiftness of the other. These combined qualities have made the blend especially effective in treating the deep, bulbous terminal hairs and curved follicles which have proven too difficult for high-frequency current alone. Treatment of these types of hairs involves a race against time—a race to destroy the lower portion of the follicle before electrical action reaches and overtreats the epidermal surface. This often requires, in addition to the blend, the use of the tapered needle and a specialized technic called "progressive epilation," which is described in the appendix of this chapter. Placed in the hands of a well trained operator, these three elements—the blend, the tapered needle and progressive epilation—have made it possible to treat every type of problem with success.

History

The development of the blended current method was the result of dissatisfaction with certain aspects of electrolysis and the high-frequency methods. Some further step was needed in order to retain the effectiveness of electrolysis without losing the speed of the newer high-frequency.

The problem with electrolysis was its slowness even with multiple needles. It did a good job on the heavy bristle and the coarser hair that the early-day operator more or less specialized in, but lanugo hair and large areas of growth on the body were considered impractical for removal with the galvanic method. The advent of high-frequency enabled the electrologist to work much faster and with full attention on a single needle; extensive cases were attempted that the multiple-needle galvanic operator would ignore.

When the multiple-needle operators first acquired the high-frequency epilator they were high in their praise of this speedy new device, and, because the regrowth was slower in reappearing than in the galvanic process, they thought the results were miraculous. With the passing of time, however, the reappearance of a large percentage of previously-treated hair was disillusioning. Alibis and excuses for such results ran the gamut from "distorted follicles" to the "hairy father" routine.

Henri E. St. Pierre of San Francisco, a pioneer electrologist in the use of high-frequency, was one of the first to recognize the shortcomings of the new high-frequency method. His desire for combining the efficiency of the galvanic method with the speed of the high-frequency method spurred him into investigating the possibility of using both at the same time. When he contacted medical equipment manufacturers to build such a piece of equipment, he was told that the currents were incompatible. "It cannot be done," they said.

It was at this time that Arthur Hinkel, as a service engineer for the General Electric X-Ray Corporation, began work on the superimposing of the two currents in collaboration with Mr. St. Pierre. Having serviced spark-gap diathermy equipment for Mr. St. Pierre for several years, your author had for some time been acquainted with the function of the hair-removal processes.

Starting in 1938 with the then-existing surgical diathermy equipment, many kinds and types of circuits were tried. A successful combination was eventually discovered. As it turned out, the superimposing of the currents was the least of the problem. The development of a working technic posed the greatest difficulty. Experimentation with various technics by Mr. St. Pierre took several years. (Your author was not a licensed electrologist until 1947.)

As a result of our joint efforts, an application for a patent was filed on July 27, 1945. This patent was granted on June 28, 1948, to Henri E. St. Pierre (Electronic Epilator Patent No. 2,444,173).

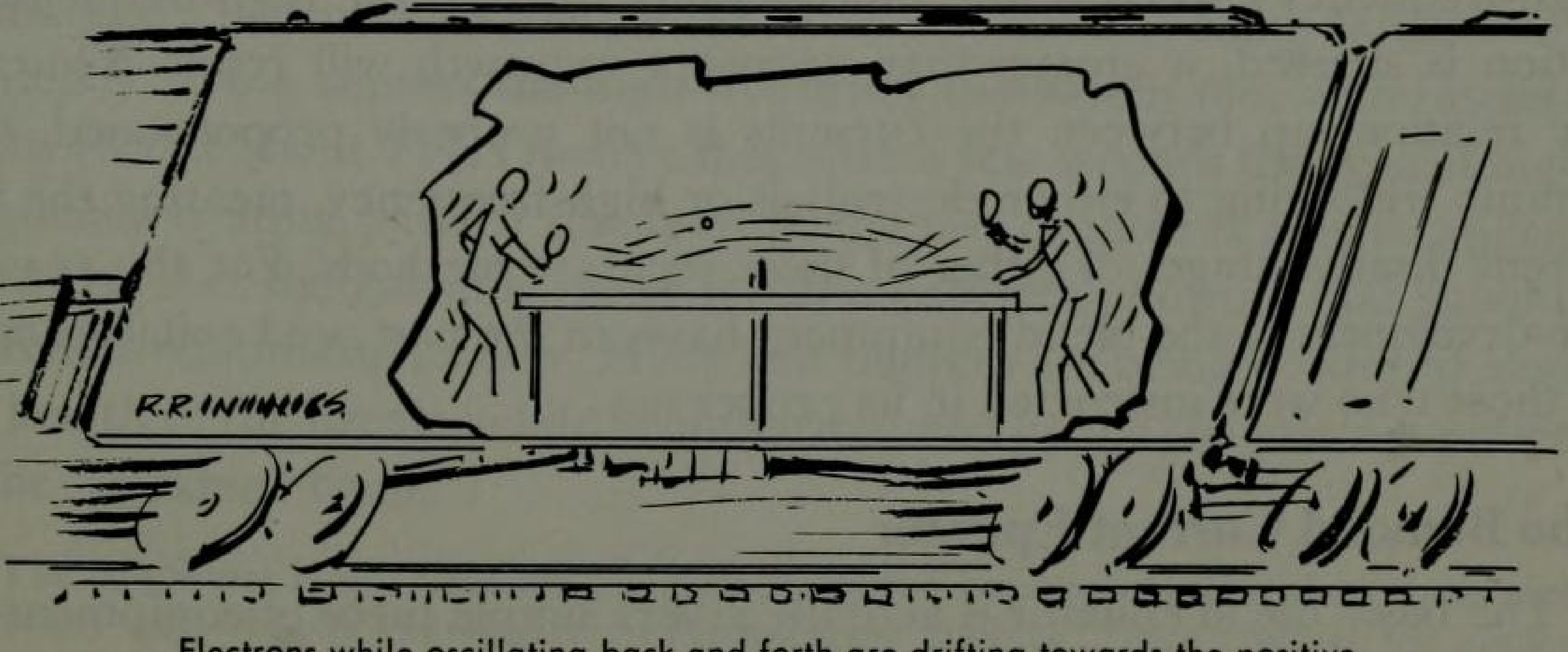
Theory of Blend Current Method

Let us first define what we mean by the "blend" or "dual action," which are the popular terms by which this method is known. As mentioned in Chapter VII, the term "blend" refers to the effects of the currents on the tissue. The currents are superimposed and are both available at the needle separately or at the same time as desired, but each current appears at the needle in its true "form." Their dual-actions are blended in their effect on the follicle.

The notion that two such currents are "incompatible" on a single electrode is based on certain misconceptions about the nature of electrical current. People tend to reason that if an electrical "current" is flowing uniformly through an electrode in one direction, as it does with galvanic, it is not possible for the same current to be continually reversing its direction, as it does with high-frequency. Nor is it possible, they insist, that there could be two separate currents in one and the same needle. Both currents would have to pass through the very same wire, which would mean that the same electrons from the atoms in the wire would be participating in both currents simultaneously—an obvious impossibility, or so it is argued.

If we return to the electron theory of electricity, and recall the manner in which an electrical current passes through conductive material such as that of a wire or a needle (see page 132), we can see that the superimposition of the "currents" is not at all impossible. Direct (galvanic) electrical current is, after all, nothing more than the linear passage of electrons, continually relayed from atom to atom in a conductive material. All of this happens at an extremely rapid rate. High-frequency current, on the other hand, involves a rapid transfer of electrons back and forth between atoms, like the ball in a ping pong game.

It is easy to understand how one electron can perform both these actions, direct and oscillatory, if we envision a ping pong game going on in the club car of a speeding express train. Although the train may be traveling at more than eighty miles per hour in a straight line, carrying a ball along with it, the ball is still able to travel back and forth at its rapid pace across the table. In the same manner, when both galvanic and high-frequency devices are influencing the electrons in a single circuit, each electron is able to vibrate back and forth even as it progresses along the wire. A flow of electrons can both be galvanic and produce a high-frequency effect simultaneously.



Electrons while oscillating back and forth are drifting towards the positive

FIGURE 107. *High-frequency with galvanic component.*

Viewing the blend current in terms of a single electron which neatly oscillates while progressing linearly is, admittedly, a somewhat oversimplified image of what actually takes place in the needle, but it helps to show how the simultaneous "currents" are possible. Perhaps a more accurate analogy would be to liken the electrons of the blend current to a wildly milling crowd, with individual "rioters" jostling back and forth within the mob, even as they are being slowly pushed out of town. Thus there is a "mass effect" of two kinds of motion or action, one of fluctuation and the other of steady progression.

The odd behavior of electrons under two combined influences results in two sets of actions around the needle. While the electrons are passing through the needle, their continuous vibrations set up the oscillating field of influence which we described in Chapter IX as the high-frequency field. This field produces a heating pattern around the needle in exactly the same way that ordinary high-frequency current does. In addition, however, when the electrons themselves pass into the tissue surrounding the needle, they influence the salt and water of the tissue in precisely the same manner as simple galvanic current, creating destructive lye in the affected tissue. It is in this way that the actions of both modalities are blended in the follicle.

Since each of the two actions of the current can be independently controlled by the operator, there are obviously many different intensity combinations to which the epilator can be adjusted. It therefore takes skill to operate the blend. The machine cannot be expected to perform well automatically; it is a tool which will yield superior results only in the hands of an operator who knows how to readjust her intensity settings for each new treatment problem. No two cases are alike, we have seen.

As will be shown, the key to successful use of the blend resides in maintaining just the right relationship between the two currents. If, on the one hand, the galvanic current is relied on too heavily, the advantage of the high-frequency's speed is lost. On the other hand, if the high-frequency's action is stressed, a greater-than-necessary regrowth will result. Thus, if the relationship between the currents is not properly proportioned, the technic will swing to either electrolysis or high-frequency, creating the inherent disadvantages of either of those separate methods. For this reason the developers of the blend equipment have, in the past, sold epilators only to those who were instructed in its proper use.

The Blended Current Epilator

The basic blend epilator is actually a very simple piece of equipment to operate. It has no timer, since fractional-second or "flash" technics are not used. It consists merely of a rheostat for galvanic control, a milliammeter

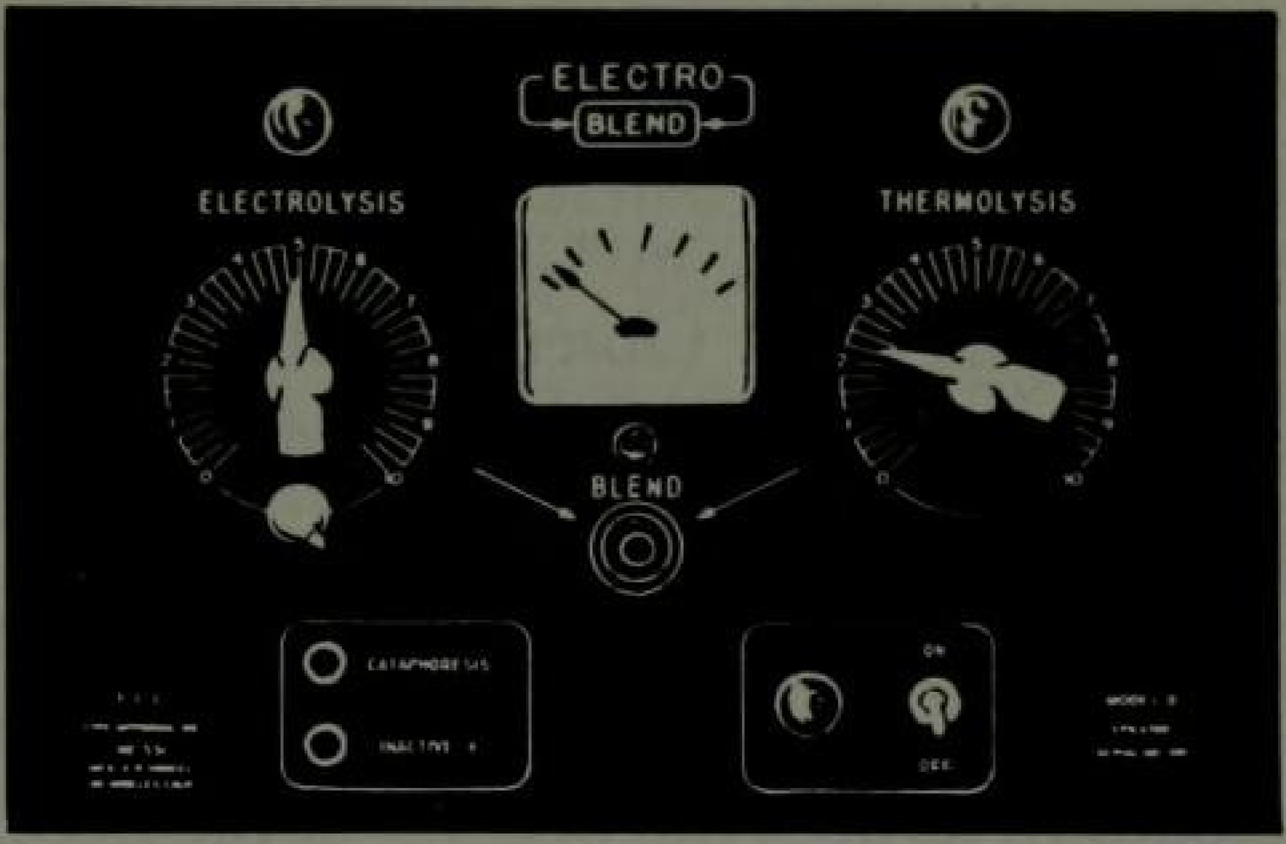


FIGURE 108. *Front panel Electro-Blend, Model D epilator.*

that indicates the amount of galvanic current and a high-frequency intensity control.

The needle cord is inserted in the negative jack (or terminal) through which both currents, high-frequency and galvanic, can flow. Both circuits are completed through the positive electrode (usually held in the hand) which is connected to a positive jack. Two footswitches enable the operator to activate either galvanic or high-frequency in combination or separately. Either current can therefore lead or follow the other, and both can be on simultaneously.

Demonstration of the Blended Current Action

The use of a piece of fresh-cut beef easily demonstrates the simultaneous presence of the two currents. The following experiment is designed to show the student how the actions occur simultaneously at the needle electrode.*

Step 1. Place a fresh-cut piece of beef at room temperature on the positive electrode, making moist contact either with the metal directly or with a wet sponge or pad.

Step 2. Place the needle electrode upon the meat and step on the galvanic footswitch. Adjust the rheostat so that the milliammeter reads about 1 ma. (i.e., 10 tenths). Observe the hydrogen bubbles being formed.

Step 3. Now depress the high-frequency footswitch too, with intensity control set at about 1¾. Observe that after a few seconds the typical high-frequency heating pattern discussed in the last chapter begins to appear. Note also that the galvanic meter is still registering, showing that galvanic current is continuing to flow. Hydrogen bubbles are being produced along the length of the needle, while being surrounded by the coagulation pattern of the "cooking" tissue.

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*The egg white is not used for this demonstration because, while it does show high-frequency patterns, its viscosity traps the galvanic bubbles. These confuse the student because both bubbles and coagulated protein appear white, making it difficult to distinguish between them. (The bubbles will disappear in time, however, whereas the cooked protein will not.)

Step 4. Move the needle to another location on the meat. Try higher intensities of high-frequency, then lower; try less galvanic, then more, moving to a fresh location each time. Observe that *a great amount of high-frequency dries the tissue to the point of non-conduction for the galvanic current* so that the meter drops to zero.

Step 5. Insert the needle into the meat and again apply both currents. Cut it open with a razor blade in order to see that an insertion in depth produces the same pattern as does the placing of the needle along the meat surface (if fresh-cut and moist).

Blended Current Action in the Follicle

The experiment we have conducted clearly demonstrates that each of the currents in the blend produces its own unique effect on the tissues. The galvanic current produces destructive lye while the high-frequency current heats up all moisture within the vicinity of the needle. In this manner the two currents "team-up" to produce a very efficient form of destruction. If the high-frequency and galvanic currents are properly "balanced" the combination is far more effective than the mere "sum" of their separate actions. *High-frequency current enhances the action of the galvanically-produced lye in three ways: (1) it heats the lye to such a degree that its caustic strength is considerably increased, (2) it cooks the tissue around the needle into a porous mass through which the heated lye solution can easily diffuse and (3) it initiates a turbulence that sends the lye solution seething through every crack and fissure in the tissue.* We shall examine each effect separately.

CATHODE: NEGATIVE POLE
P. 170-1;'62

(1) **Increased causticity.** Let us consider the heated-lye effect first. High-frequency current, as we know, heats all moisture within its field of influence. It follows that the very same solution of sodium hydroxide being formed in the follicle by galvanic action is being heated by the high-frequency field as well. Controlled manually, this heat does not get high enough to evaporate the lye solution out of the tissue. Instead, its near-boiling intensity agitates the lye into highly caustic action. *Heat is an agent which speeds up the chemical action of sodium hydroxide on tissue.* Research has disclosed that for every increase of 22.4° F. in temperature above 115° F., the reaction rate of sodium hydroxide on organic material approximately *doubles.** This means that with temperatures ranging from

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*These figures were reported by Dr. Jennings of the University of California at Davis in an article entitled "Scientific and Technical Aspects of Circulation Cleaning in the Dairy Industry," *Dairy Science,* April, 1961. Although Dr. Jennings conducted his experiments (using milk, an organic compound) at temperatures no higher than 180°, he found the progression to be linear and reasoned that this reaction rate would remain constant through higher temperatures.

130° to 200°, the heated lye solution produced by the blend is anywhere from *two to sixteen times more effective* than lye produced by ordinary galvanic current at body temperature (98.6° F.).

(2) **Porosity.** A second advantage provided by the combination of high-frequency heating and galvanic lye is the fact that it renders tissue porous. If applied at intensities below those which cause moisture to boil away, high-frequency heating will coagulate tissue rather than desiccate it (see page 177). A mild heating pattern in the tissue will scald and break down the cellular structure, causing the protein within the cells to congeal into a whitish, spongy texture. With the intercellular fabric of the tissue thus broken down, heated lye which has been building up around the needle is able to diffuse much more readily through the confining walls of the follicle. The result is a wider, more thorough pattern of destruction than that provided by simple high-frequency current because *the porous condition of the coagulated tissue enables galvanic lye to invade tissue to which it could not otherwise gain access.*

It is easy to observe the spongy quality that tissue acquires through coagulation. Simply place a drop of ink on a piece of raw meat and an identical drop on a piece of cooked (preferably steamed) meat. The ink rolls around on the surface of the raw meat without significantly penetrating the surface. On the cooked meat, however, the liquid is absorbed into the surface almost immediately. In the same manner, lye is enabled to travel through cooked tissue without having to "eat out" a passageway first.

(3) **Turbulence.** Another closely-related advantage of the heating pattern is the turbulence it creates in the body fluids. Rather than simply working its way through tissue by diffusion and caustic action, the lye solution surrounding the needle tip is whipped into action in the same way that juices simmer in a pan. This sends hot lye rushing into every opening it can find, forcing it through the porous fabric of the coagulated tissue. The entire area of the heating pattern is quickly saturated with hot lye, enabling it to go to work on the cells at the outer perimeter of the pattern.

You can see how quickly galvanic lye is disseminated when both currents are applied by conducting a simple experiment with your blend equipment. First obtain a small rectangular cut of beef and attach it by means of a rubber band to a glass microscope slide, so that one side of the meat is flush against the surface of the glass. Try to position the meat so that the "top" is even with one edge of the slide. This will give you a slot between the glass and the meat into which you can insert the needle. Be sure the meat is connected to the positive electrode.

Begin by observing what happens at the inserted needle when galvanic current is used by itself (use about 1.0 ma). You will see a narrow area of

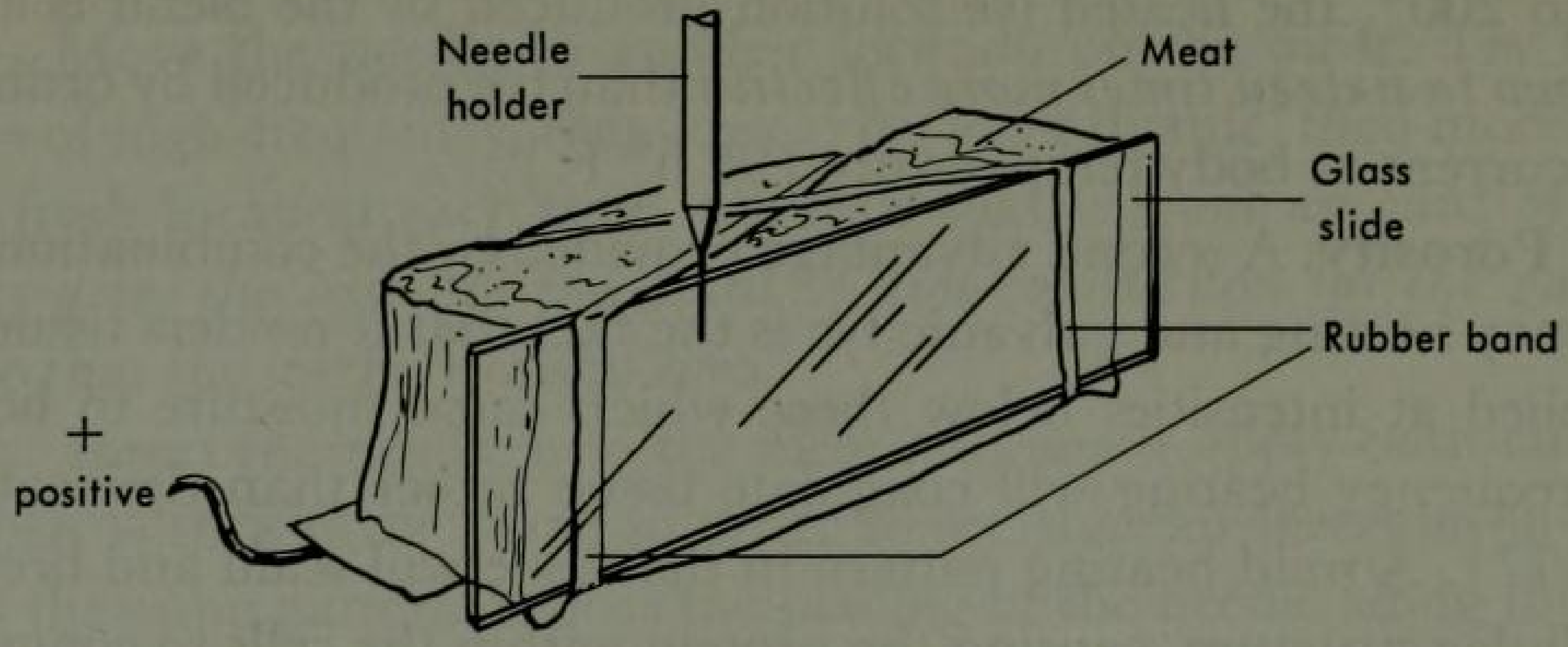

Figure 109. *Setting up experiment for observing action of lye during blend.*

meat around the needle becoming slowly liquefied, with whitish bubbles of hydrogen and chlorine rising through it. Now remove the needle and reinsert it a short distance away. This time apply just the manual high-frequency. Observe the width of the pattern of coagulation. You will find it considerably broader than the area affected by galvanic lye when applied for a similar period of time. It can be seen that lye is very slow to penetrate tissue when produced by ordinary galvanism. This, no doubt, accounts for the slowness of ordinary galvanic treatments in comparison with high-frequency epilation time.

But now let us see what happens when galvanic current is applied in conjunction with high-frequency. Reinsert the needle in an area similar to the last and apply both currents at the setting used in the two previous insertions. If the machine you are using does not have a built-in galvanic current delay, be sure to start the high-frequency action one second before applying galvanic. With your currents properly blended (this may require some experimentation), you will be able to observe through magnification that the turbulence of the developing lye solution swiftly carries throughout the entire area of coagulation created by the high-frequency field. The bubbles and froth can easily be seen.

The three factors we have been discussing—increased causticity, porosity and turbulence—combine to make the lye solution produced by the blend

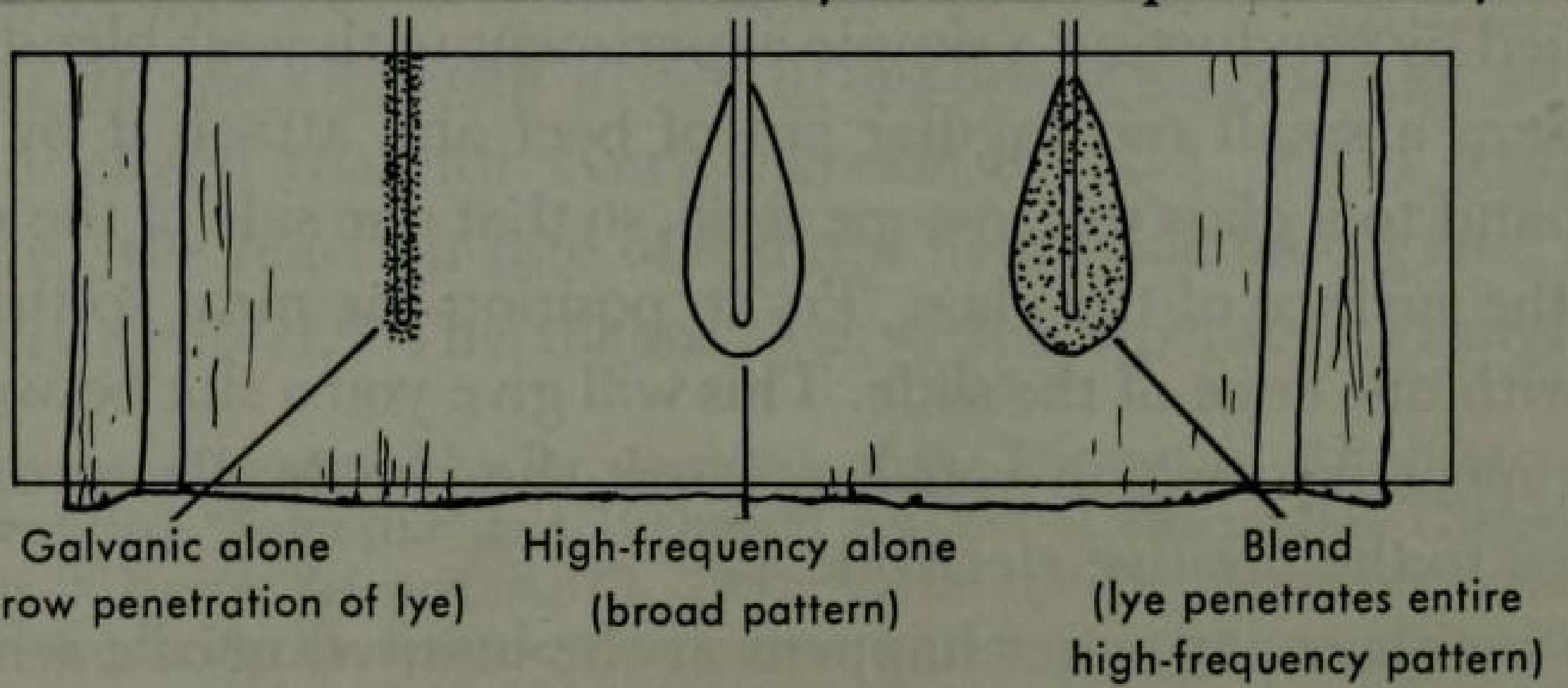
Galvanic alone
(narrow penetration of lye)
High-frequency alone
(broad pattern)
Blend
(lye penetrates entire high-frequency pattern)

Figure 110. *Effects of high-frequency on penetration of lye.*

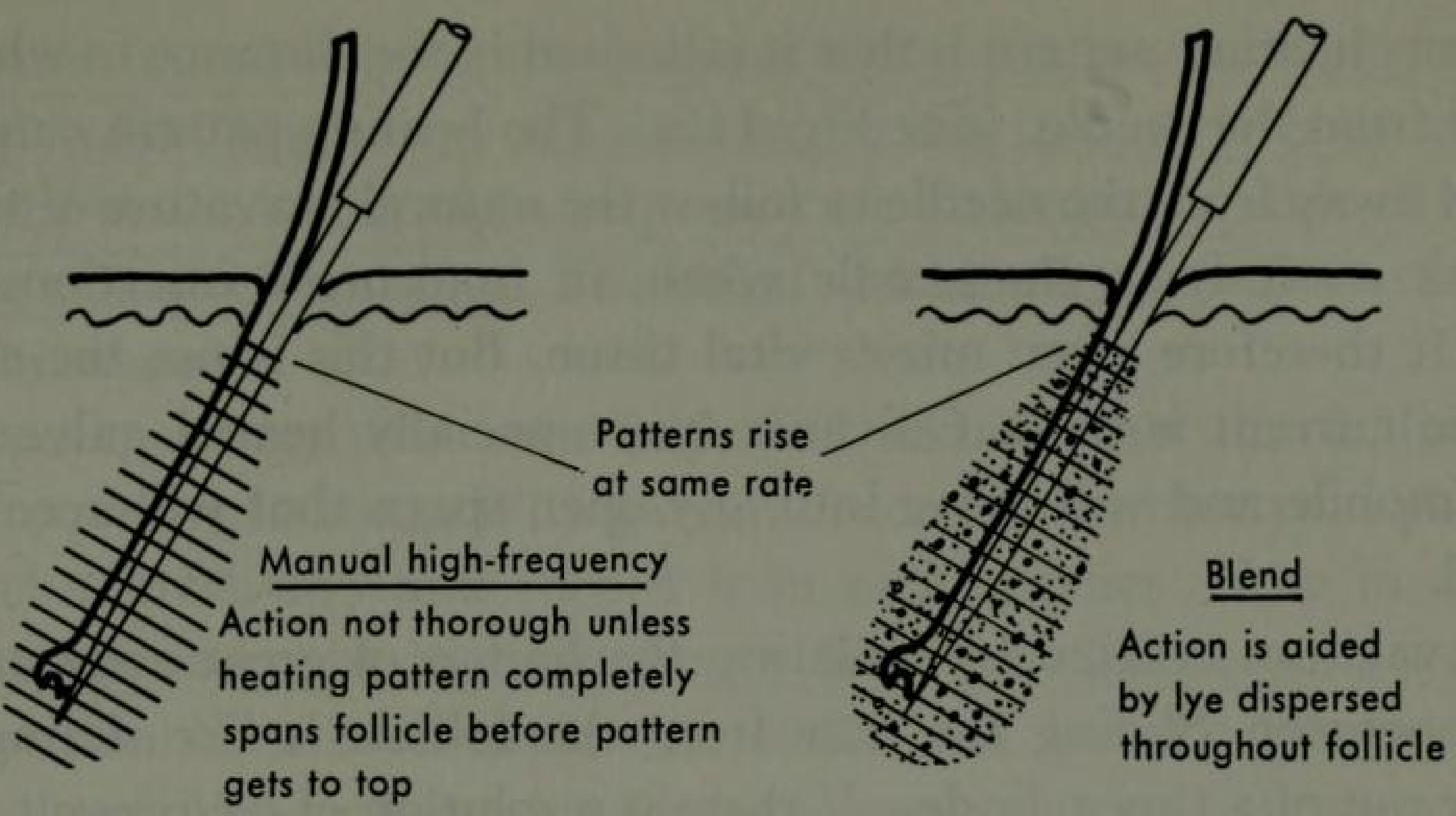
Patterns rise
at same rate
Manual high-frequency
Action not thorough unless heating pattern completely spans follicle before pattern gets to top
Blend
Action is aided by lye dispersed throughout follicle

FIGURE 111. *High-frequency versus the blend in a deep, difficult follicle.*

a hyper-active agent. The destructive action of this agent is bolstered by the coagulating action of the high-frequency field itself. As a result, the blend requires only *one-fourth* the amount of galvanic lye ordinarily needed to effect a permanent elimination of the follicle. Continual research on the subject has shown that, for example, a certain type of hair requiring 180 "units" of lye with simple electrolysis needs only 45 or 50 units with the blend. This ratio remains constant for all depths and types; it is always around one-fourth. The result is that the blend provides the same degree of destruction as electrolysis in a much shorter time.

The speed of destruction, as we have seen, is especially important in treating the deeper, more difficult follicles. Our analysis of high-frequency heating patterns in the last chapter has shown that the electrologist's greatest problem is to treat the lower portion of the follicle thoroughly before the heating pattern can reach the surface. Deeper-growing hair must often be tweezed when high-frequency alone is used. This problem is solved by the blend's hyper-active lye, however, which is able to supply the needed degree of destruction within the time limit imposed by overtreatment factors. This is one of the blend's major advantages—its ability to epilate and eliminate deep difficult hairs with the swiftness of the manual high-frequency technic (often with the assistance of the tapered needle and progressive epilation), thus avoiding overtreatment and providing a fast epilation technic in the bargain.

Near-Misses and Curved Follicles

Another major advantage of the blend is its ability to cope with near-misses and curved follicles. Although these have never posed too great a threat to the slow-but-thorough galvanic method, they have become a major obstacle to the high-frequency technic. The problem with the high-frequency heating pattern is that it is limited in the distance to which it can expand from the needle. (See Fig. 112.) The heating pattern cannot curve or bend away from the needle to follow the natural curvature of the follicle or sneak away from the needle when an inaccurate insertion has been made. It therefore often misses vital tissue. But this is not the case when galvanic current is used. Galvanic lye, especially heated galvanic lye, is highly mobile and will move into any open space that will accommodate a liquid.

The vacuum created by epilating the hair is of great assistance to the blend operator. Sliding the hair from the follicle is like sliding a small plunger out of a tiny cylinder. If there is a solution of lye present, it will be drawn into the follicle by the removal of the hair, as water is sucked up by an old-fashioned kitchen pump. As the evacuated follicle contracts around the fluid, it exposes its entire target zone from papilla to hair germ cells to the effects of the lye. The blend operator usually allows an additional second or two of galvanic current to flow into the disrupted follicle after the hair has been epilated to insure that sufficient lye has been introduced. These factors have assisted the blend technic in attaining a remarkably small regrowth rate.

Neural Effects of the Blend

One of the factors that enable the blend to work so much more quickly than ordinary electrolysis is the peculiar way in which high-frequency reduces the patron's response to galvanic current during application of the combined currents. Ordinarily galvanic current is relatively painful to many patrons, even at 2/10 milliampere (ma.). However, the addition of high-frequency current with the blend does not "double" this pain. On the contrary, if the high-frequency current is introduced first, the pain from

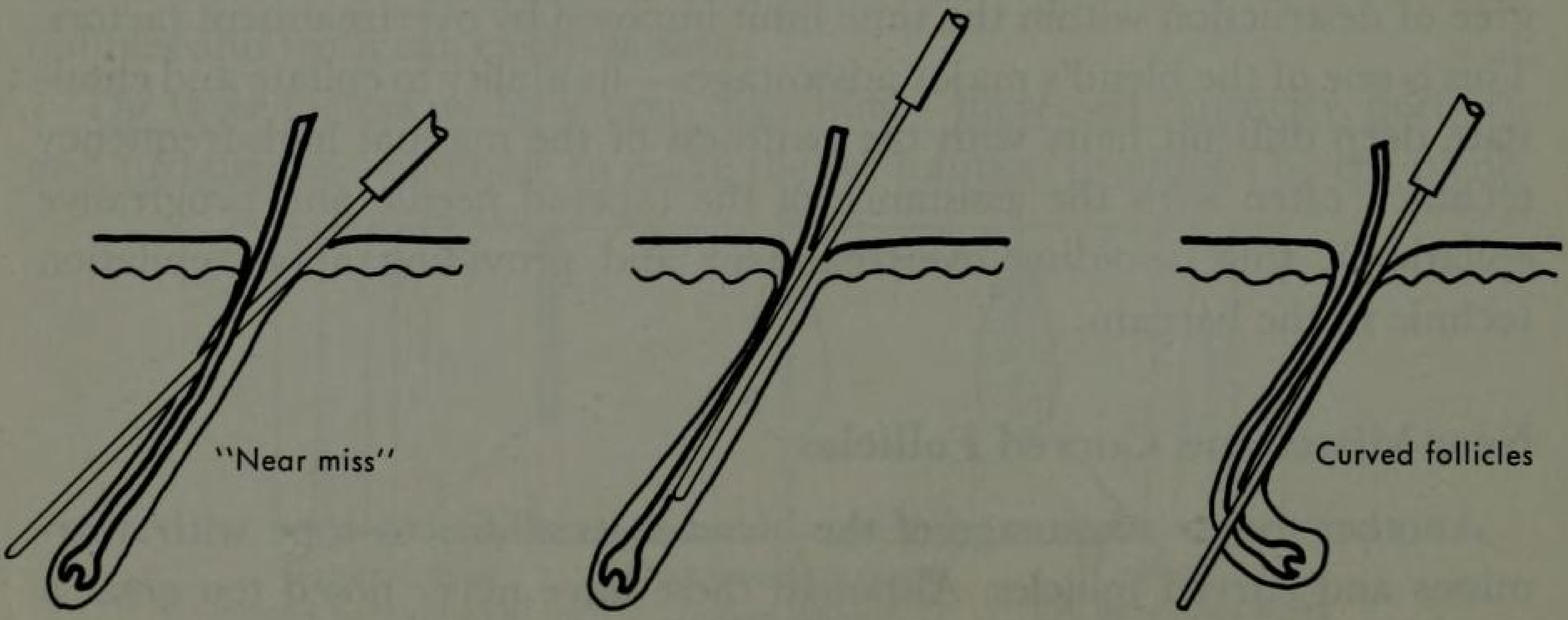

FIGURE 112. *Near-misses and curved follicles benefit by fluidity of lye.*

the galvanic current becomes imperceptible. Only the high-frequency "cooking" is felt. This seems to be due to the fact that nerve endings coagulated by the action of the high-frequency are no longer capable of responding to the caustic effect of lye. The blend machine has a built-in time delay for just this reason.

An experiment on your own body will demonstrate the dulling effect of high-frequency heating. With galvanic alone, determine your pain tolerance level (threshold) and record it in milliamperes. Now in a similar follicle nearby start the high-frequency first, then follow with a galvanic current at double or even triple that which you found earlier to be your tolerance level. You will see that high-frequency current allows you to use a galvanic current two to three times stronger without any increase in sensation over that of the high-frequency. With a patron's tolerance thus increased, the blend operator has little difficulty in "pouring in" the required amount of galvanic current in the time normally needed by manual high-frequency to epilate the hair.

Determining the Proper Balance of Currents

The aim of treating each follicle with the blend is to produce *complete destruction of the lower follicle in the shortest amount of time.* The completeness of destruction, we have found, is based largely on the amount of hyper-active lye produced in the follicle. The amount of time required for any given follicle, as we shall see, is dependent on the action of the high-frequency. Stated simply, then: *the balancing of the blend consists in proportioning the proper amount of galvanic current to the span of time required for high-frequency epilation.* There is a simple formula for computing this proportion, but it cannot be fully appreciated until we have explored in greater detail its determinant factors: (1) epilation time and (2) the required quantity of lye.

1) THE TIME FACTOR IN THE BLEND

How do we determine the length of time to apply the blend? The student can discover this experimentally for herself by first applying simple high-frequency to a hair in a given region on her body, then applying simple galvanic to a similar hair in the same region and lastly applying a blend of the two to a third such hair. Let us say that the first hair epilates in ten seconds (high-frequency). The second hair will take perhaps forty-five to sixty seconds (galvanic). As it turns out, the third hair, the one on which she uses the blend, will take somewhat less than the first hair, say about nine seconds. This means that *it is the high-frequency current which primarily determines the length of time to* *apply the blend.* Adding the galvanic makes only a slight difference in epilation time. High-frequency epilation speed therefore establishes the time factor for the blend.

Ultimately, the patron's pain tolerance level and the sensitivity of her skin determine the shortest time required to treat each follicle. The higher the intensity of high-frequency the patron can take, the faster the operator can work. Establishing a "working point" or technic speed has been discussed at some length in the chapter on high-frequency, and the procedure for establishing the technic speed for the blend is done in exactly the same way. Once the "working point" has been reached, the number of seconds it takes for the average hair to be epilated must be noted, for this figure is needed as our time factor in calculating the correct intensity of galvanic current, which we shall discuss next.

2) THE LYE QUANTITY FACTOR

How much lye must we "pour" into the follicle during the time we are treating it? If we think of follicles as tiny test tubes of varying sizes, we can see that more liquid would be needed to fill the large ones than small ones. Much more lye solution is needed, for example, for a deep, coarse, bulbous hair than for a shallow, side facial hair. The question is, how much more? In using galvanic current by itself, we always knew when enough lye had been produced because the hair would epilate when sufficient decomposition had taken place. In the blend technic, however, the fact that galvanic current does not greatly affect the epilation time deprives us of a working guide for producing the correct amount of lye.

To solve the lye-quantity problem, your author, Arthur Hinkel, conceived the "units of lye" method. As explained in the chapter on galvanism, the amount of lye produced galvanically is computable as the product of the amount of time the current is flowing. This formula was expressed in large commercial quantities (amperes × hours = gallons). In the microscopic world of the follicle, where we deal with milliamperes and seconds rather than amperes and hours, a different kind of measurement for lye other than gallons or quarts had to be employed. We have simply called it a "unit," which you might imagine as a tiny droplet or minuscule quantity of lye solution. *One tenth of a milliampere of galvanic current flowing for one second will produce one "unit" of lye (tenth milliamperes × seconds = units of lye).**

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*"Units of lye" is analogous to candlepower per second in photography; in X-ray radiography it would be "milliampere seconds."

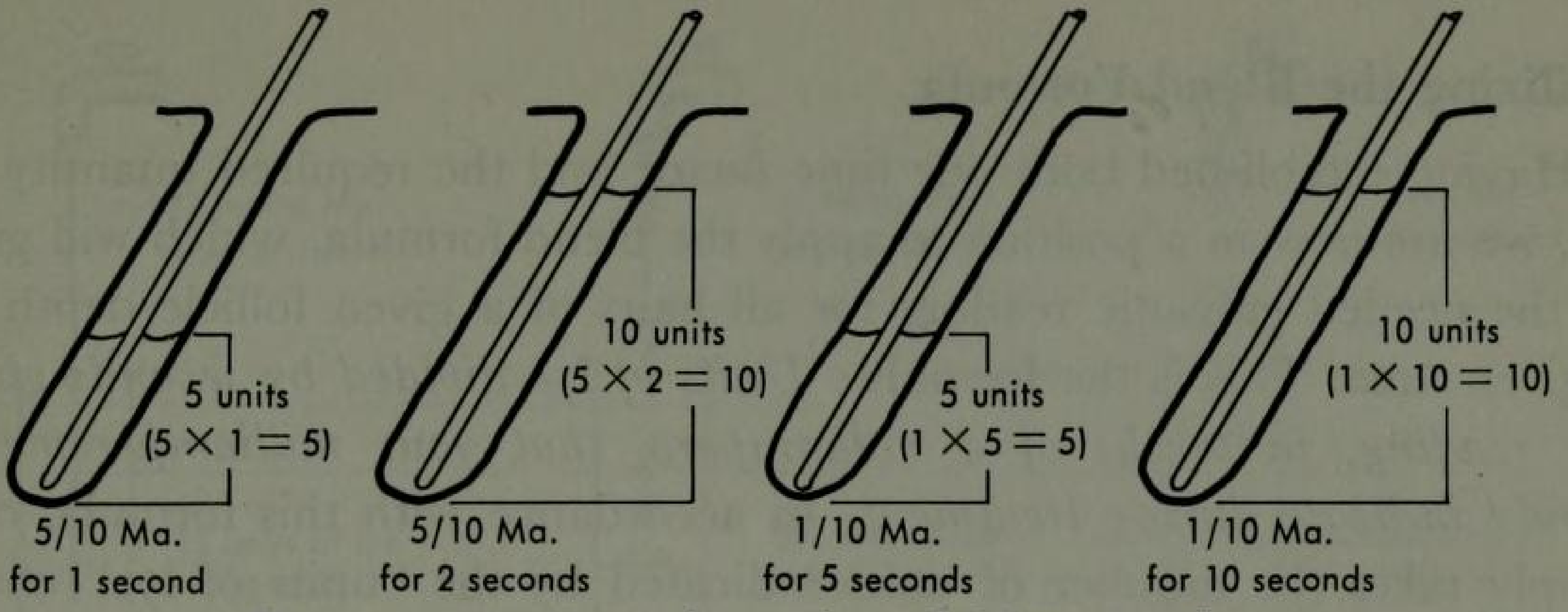

FIGURE 113. *Hypothetical model for visualizing production of lye in the follicle.*

Equipped with this systematic basis for measuring lye production in the follicle, your author (Hinkel), on the basis of personal experience as well as data obtained from a number of experienced operators using the blend, has ascertained the effective quantities of lye necessary for each kind of follicle. The following chart represents the results of that survey. Memorize it. It is your guide to those quantities of lye necessary for calculating the galvanic meter reading for the blend.

"UNITS OF LYE" CHART

Type of hair	Usual locations	Quantity of lye
Shallow — lanugo	Cheek, lip.	15 units
Medium deep — terminal	Side face, chin, arms.	45 units
Usual deep — terminal	Women — chin, legs. Men — back and shoulders.	60 units
Very deep — terminal	Men — beards.	80 units

Of course, actual hairs do not come in four convenient sizes, but it must be realized that the "units of lye" chart deals with approximations. What is important is the fact that these approximations have a "built-in" margin of error; they do not have to be exactly "right." For one thing, these units represent somewhat more than a bare minimum for each type. For another, galvanic current is self compensating, as we saw in Chapter VIII; a shallow insertion automatically reduces the amount of current flow at a given setting and a deeper insertion increases it. Because of these considerations the electrologist does not have to readjust her settings for every hair. All hairs of a *similar type* can be treated identically.

Utilizing the Blend Formula

Having established both our time factor and the required quantity of lye, we are now in a position to apply the blend formula, which will give us the needed galvanic reading for all hairs of a given follicle depth in a given area. This is the formula: *Units of lye divided by seconds gives the reading, in tenths of a milliampere, that your milliamperemeter should indicate during treatment.* In accordance with this formula, one simply takes the number of units indicated by the "units of lye" chart and divides it by the number of seconds it takes to epilate the hair with high-frequency.* The galvanic dial should then be adjusted to produce the computed amount.

To understand how this formula works, let us take, as a hypothetical example, a group of follicles in a given area which give every evidence of being medium-depth, pigmented terminal hair types. It can be seen from our chart that each of these hairs requires 45 units of lye. Suppose, now that we have found that hairs in this area take around five seconds to epilate (comfortably) using high-frequency current alone. This is our time factor. Now if we think of our galvanic current control as being a kind of a faucet which pours out more liquid the higher it is turned, we can appreciate how the above formula helps us "fill" the follicle in the five seconds it takes to epilate the hair.

In order to appreciate how the formula enables us to introduce the "right" amount of current, let us suppose we were to allow only 3 tenths of a milliampere of galvanic current to flow during the five seconds it takes the high-frequency to epilate a typical hair (in the type of area we have been discussing). As shown in Fig. 114 (Drawing A), we would be applying only a small portion (15 units) of the necessary lye in five seconds. If we used even 6 tenths (Drawing B), we would still be pouring in a inadequate amount (30 units) of lye. But since we know that a hair of medium depth requires 45 units of lye (Drawing C), we need merely divide units of lye (45) by the number of seconds (5) to obtain the correct milliampere reading. This, obviously, is 9 tenths ($45 \div 5 = 9$). At this setting the galvanic current will produce just the amount of lye we need in the five seconds that we are also applying the high-frequency.

For treating all hairs of the same type in the area, the operator now knows both of her settings for a proper blend; she should keep her high-frequency setting at the "working point" and her galvanic setting where her computations have put it.

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*For those students who have difficulty in performing simple division, a chart has been provided in the appendix of this chapter. However, most students should have little difficulty with this easy-to-use formula.

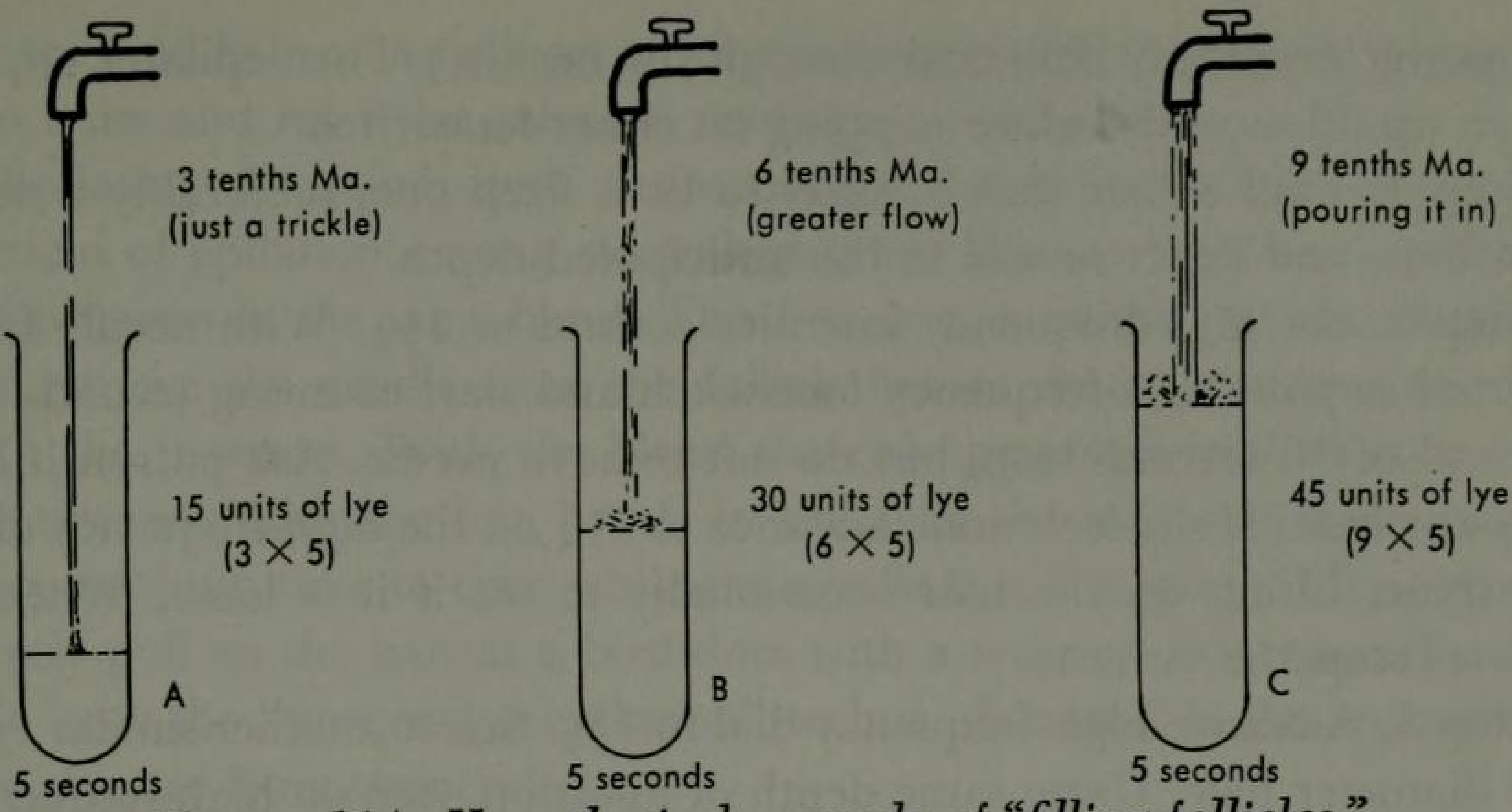

FIGURE 114. *Hypothetical example of "filling follicles."*

Summary of Steps for Establishing Blend Settings

The general procedure for establishing settings for the blend technic can be briefly outlined as follows:

(a) Using high-frequency only, establish a "working point," that will give you the correct high-frequency setting.

(b) Count the number of seconds needed to epilate the average hair with high-frequency.

(c) Refer to the chart to decide the number of units of lye needed for the type of hair being treated.

(d) Divide the number of units of lye by the number of seconds. That will give you the correct galvanic meter reading.

This outline is not to be considered the technic itself. It is merely a guide to those settings which will produce the correct balance of currents in a minimal amount of time. There are actually *two standard blend technics* that utilize these calculations: one for the *face,* the other for the *body.* We shall discuss each of these in turn, along with a few of the many possible variations that can be used to adapt the blend technic to varying skin conditions and pain reactions.

FACE TECHNIC

Procedure for Setting Up the Blend: Standard Face Technic

The high-frequency intensity settings suggested in the following step-by-step technic pertain specifically to the Model D Electro-Blend epilator (and all future models).

✓ When setting up the patron be sure to keep unshielded positive and negative electrode wires away from one another and spaced away, where possible, from the patron's body. (Contact of this kind would reduce the power ordinarily delivered through the needle.) Turn epilator on, let warm up 30 seconds before stepping on either footswitch.

Step 1. Find a hair that is likely to be a deep one, preferably a deep chin hair, and insert needle to the anticipated depth.

Step 2. Set high-frequency intensity control to 1¼. With needle fully inserted step on high-frequency footswitch and start counting seconds. At the end of 10 seconds stop, but do not remove needle. Ask patron if she feels any heat. If she feels none advance to 1½ on the high-frequency dial. Continue, lifting on the hair occasionally to see if it is loose. When it epilates stop the current.

Step 3. Advance high-frequency dial to 1¾. Select another similar type and diameter hair. Using same depth of insertion, step on high-frequency footswitch, counting seconds until hair releases. Remember, we are testing the hair with the tweezer in the left hand. (If the present setting is just below the patron's pain threshold, proceed to step 4. If not, continue raising the setting in steps until the "working point" is reached.)

Step 4. When hair epilates stop high-frequency *but do not remove needle*. Remember how many seconds it took for the high-frequency to release that hair. Divide that number of seconds into 60 (see chart; this is a deep hair). Let us presume, for the sake of example, that it took 10 seconds. Then 60 ÷ 10 = 6. So step on the galvanic footswitch and advance the rheostat to make the meter register 6 (tenths). (The patron would not feel this "pure" galvanic current for at least 15 seconds because of the coagulated nerve tissue.)

Step 5. Select another similar hair, step on both footswitches. The milliammeter should read about 6 tenths.

Step 6. Lift gently on the hair after about 8 to 10 seconds. When it slides out, stop the high-frequency but continue galvanic about 2 seconds. You have just "killed" a hair. Oh Joy!!!

It can be seen that our first consideration in setting up the blend technic is the time it takes the high-frequency to release the hair (steps 1 to 3). That tells us how long the needle *needs* to be in the follicle for the high-frequency to cook the hair loose. Since we want to put lye into the follicle at the same time, we refer to our chart, finding that 60 units of lye is what this follicle needs for a thorough treatment. We know that in this case the needle must be in the follicle for 10 seconds, so we divide 60 by 10, which gives us 6 (step 4). We then adjust the galvanic rheostat to make the meter register 6 tenths (step 5). After that, it is merely a matter of epilating hairs with both currents at the established setting, applying a little additional galvanic after epilation (step 6). No further calculations need be made for all similar hairs in the same area. However, when we begin a new type hair or a new area, we must again count seconds for one or two hairs and reset the galvanic readings accordingly.

Epilating the hair is itself an important part of the technic. A popular method of epilation among electrologists has been to hold the needle and the tweezers in the same hand. This however, requires that the electrologist remove the needle from the follicle before she can remove the hair with the tweezers. With the blend the only practical method is to hold the tweezers with the free hand. In this way the hair may be tested for looseness from time to time while the needle is still in place. (Do not constantly pull on the hair as a bird does with a worm.) For especially difficult hairs the "progressive epilation" technic discussed in the appendix of this chapter is recommended.

X By removing the hair with the free hand the electrologist is able to apply an additional second or two of galvanic current after epilation. This is what we call the "after count." The most important use of the after count is its application of lye to a follicle which has been considerably torn up by the epilation, exposing much of the vital tissue to caustic action. In addition the after count compensates for the galvanic delay at the start of the treatment. Some hairs will epilate sooner than others but we do not have to compensate for these variations. The "unit of lye" number takes into account such minor variables.

It is important to note that in treating either the face or the body the conductivity of the patron's skin at the positive electrode will change after five minutes or so, causing the galvanic milliamperage to rise. This necessitates turning down the rheostat. Shifting on the part of the patron or moving the contact at the positive pole during a long treatment will also require occasional rheostat changes. Be sure the wet electrode has plenty of salt in the wetting solution (at least one heaping tablespoon of salt to a pint of water).

Adjusting the Blend Technic to Varying Conditions (Face Work)

The use of a special technic for the face makes it possible to provide a thorough treatment of each hair without producing unsightly scabs or ✓ blisters on the surface of the skin. If overtreated, the face is far more susceptible to pitting and depressions than the body. One of the most valuable aspects of the blend lies in the flexibility of technic it offers the electrologist for dealing with this problem. Different cases require special handling because of the variations you find in their nerve responses, skin conditions, follicle structures and the manner in which they have been dealing with the excessive hair problem. Each such case can be fully treated by an appropriate alteration in intensity settings.

Without exception, every variation of the face technic (and body technic as well) must employ the units of lye formula in order to establish the correct dial setting for the blend. Whether you lead, follow or interrupt the various current sequences, if you do not follow the formula, you will probably use too much or too little galvanic current. If too much lye is produced unnecessary welting may occur. If too little lye is produced, the follicle may be insufficiently treated. The units of lye system helps avoid all such difficulties.

The standard face technic offered above was hypothetically performed in an ordinary situation—a deep chin hair on an average skin. The ten seconds needed to epilate the hair was also average for this type. But what will happen when we encounter extremes of pain tolerance and skin moisture? To give you an idea of the way the standard technic adjusts to suit extreme conditions, we shall briefly outline two typical examples of somewhat extreme conditions encountered with deep chin hairs. Think of these being handled with the same sequence of steps used in the above procedure.

Typical Case #1. If the patron's pain tolerance level is high and her skin dry (as found on an older woman) the epilation speed could be increased to a working point at say 5 seconds of high-frequency. In this case the galvanic milliampere reading would be advanced to 12 tenths ($60 \div 5 = 12$) in order to get 60 units of lye. Because you are able to raise the high-frequency setting, your technic speed is considerably increased.

Typical Case #2. If the patron's pain tolerance level is low, you will not be able to turn the high-frequency intensity control very high. The release of the hair with high-frequency would therefore take a longer time, say a 15 second "working point." The galvanic milliampere reading would have to be reduced to 4 tenths ($60 \div 15 = 4$) in order to produce 60 units of lye.

Variations in the Sequence of the Currents

Leading With High-frequency

In an earlier discussion we point out that one of the unexpected results of the blend experiment was the fact that the only pain experienced by the patron was that of the high-frequency. Instead of the pain being greater with the combined currents, as one might expect, the cooking of the tissue by the high-frequency seems to eliminate the pain sensation ordinarily induced by the production of sodium hydroxide.

In our standard technic we activate both footswitches simultaneously, but because of a built-in time delay, the galvanic meter does not register for one second. The head start thereby given the high-frequency is usually enough to prevent the galvanic action from being felt.

On some patrons this one second lead is not enough to keep the galvanic pain from coming through. In these cases you should step on the high-frequency footswitch first. After one or two seconds step on the galvanic. Remember—this particular patron may not need this special technic in all areas or at all times in the same area. The human factor must always be considered.

Leading With Galvanic

In some cases, because of unusual skin or hair conditions, a kind of obstruction occurs when the needle has reached the inner root sheath. See Fig. 115. The obstacle resists penetràtion, and while force would permit entry, it would probably cause the needle to overshoot the desired depth in overcoming the obstacle. It would also be painful to the patron—a most important consideration.

We can easily eliminate this insertion difficulty by applying the galvanic first. Insert to the obstruction, holding the needle still, with enough pressure to produce a slight dimpling of the skin. Step on the galvanic, and in a second or two the needle will be enabled to slide past the obstruction. Continue to the follicle bottom and immediately add the high-frequency. Proceed then as usual.

Elimination of Galvanic After-Count

There are times when the epilation of the hair is so easy and the appearance of the hair root is so obviously transparent and juicy that the need

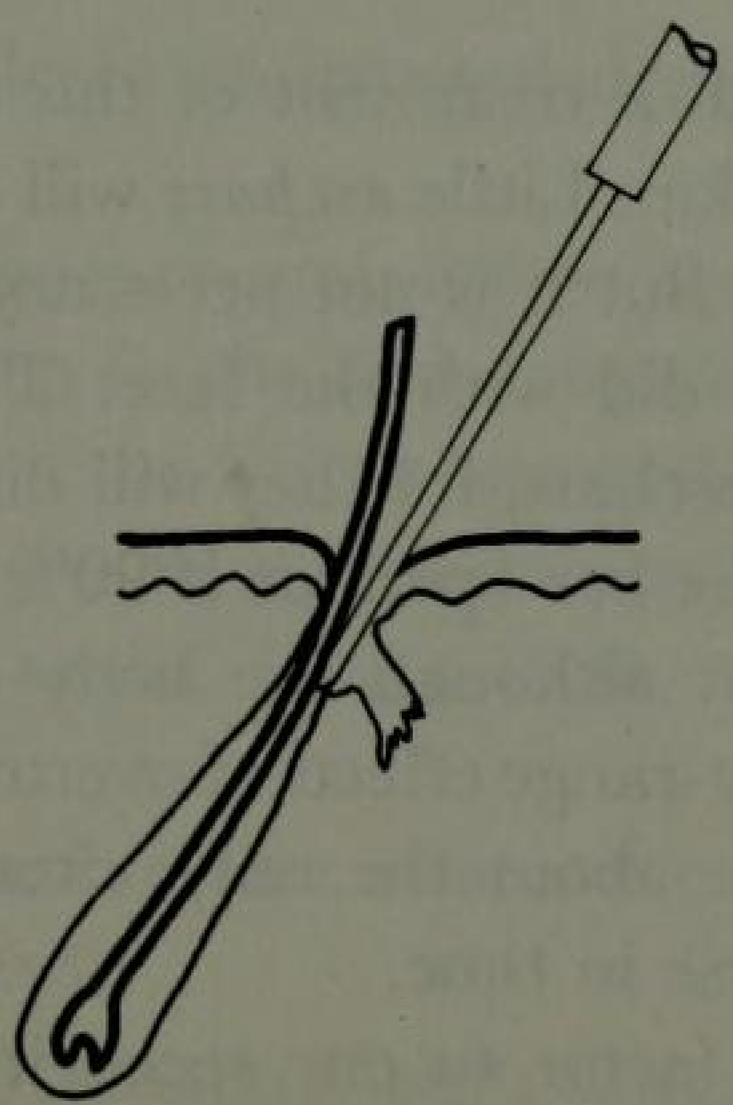

FIGURE 115. *Difficult insertion aided by galvanic.*

for a galvanic after-count seems unnecessary. In these cases we merely step on and off both footswitches simultaneously.

Extension of Galvanic After-Count

If on occasion you discover that an epilated hair you have treated has been growing from a greater depth than that to which you inserted, slide the needle down the follicle to a lower depth and continue with just the galvanic for 3 or 4 seconds. As we mentioned, always keep your mind on destroying the papilla and hair germinating tissue. Do not let the release of the hair be your only concern.

We have discussed leading and lagging with galvanic as well as leading with high-frequency. There seems to be no occasion to lag or give an after-count of high frequency. All of the foregoing technics and variations are intended for face work. In every case the unit-of-lye quantity is based on our chart according to follicle depth. Although the theory for body treatment is quite different, the units-of-lye formula is applied to body work as well.

BODY TECHNIC

Theory Behind the Technic for Body Treatment

Body treatment with the blend differs radically from what we have been doing on the face. In the first place, the appearance of the skin a few days after treatment is unimportant in body treatment; people are not as concerned about the appearance of their arms and legs as they are about their faces. Moreover, the area that has to be treated is much more extensive than any facial area. This means that *speed* is the primary consideration.

As might be expected with a treatment of this type, there is some reaction at the surface of the skin. Little *eschars* will appear after treatment (tiny honey-colored crusts). But it is not necessary that we concern ourselves with each hair as we did with the face. The patron will forgive the electrologist for the tiny eschars, for they will disappear in one to three weeks, but she will not forgive her operator if 90% of the growth returns. It is interesting to note that although the body develops eschars more readily than the face, the long-range effects of overtreatment are less severe. White spots or freckling are about the only after effects which can be caused, and these will disperse in time.

Pain is the only limiting factor to our speed in body work. For that reason we try to use an intense high-frequency current in one to two second bursts, which can be turned on and off before the patron's nerves can respond. This is not a "flash" type treatment, however, for two reasons:

first, the intensity is considerably lower and the time longer than with the flash, allowing for a much broader heating pattern, and second, the follicle is being inundated with a *full* galvanic application simultaneously. One to two seconds of current at the intensity used in body work is usually the limit, although some patrons are able to take up to four seconds of high-intensity high-frequency without experiencing excessive discomfort.

As with face work, successful body treatment requires a proper balancing of the blend. The count and the formula are still important. On the face and head we slowly advanced the high-frequency intensity to reach our working point, but on the body we start out at a much higher intensity, trying increasingly longer bursts of current to find the patron's pain tolerance level. When both the right *intensity* of current and the *maximum* intervals of application are found (at the working point), the needed amount of galvanic current can be computed on the basis of total time in the follicle. With this kind of technic a number of variations are possible.

(Some blend operators use a shallower insertion for the body than they do for the face. This practice is based on the fact that the majority of hairs growing on the body are in the telogen stage of growth and therefore possess shallower follicles. Treating at a shallower depth would leave deeper hairs unaffected but increases the speed of the technic. The slightly higher regrowth rate, it is believed, is compensated for by the greater speed.)

Procedure for Setting Up the Blend:

Standard Body Technic (Below Base of Neck)

Turn epilator on, let warm up thirty seconds before stepping on either footswitch.

Step 1. Insert needle to anticipated depth of, let us say, a medium-depth arm hair.

Step 2. Set high-frequency intensity control to 3 on the dial. With the needle fully inserted, step on the high-frequency footswitch for one second and stop. Check to see if the hair is loosened.

Step 3. Reinsert, if you have withdrawn the needle, apply current for another second. Test again. If not loose, try a third second of high-frequency.

Step 4. If hair does not release, tweeze it and reinsert in another similar hair a short distance away.

Step 5. Raise high-frequency dial to 3½, step on high-frequency footswitch for one second, test looseness. If not loose, try another one second burst. (Most patrons' nerves can tolerate bursts of one second but not of two seconds.) If the hair releases as the result of 2 one second taps on the footswitch you know that a total of two seconds of the high-frequency current at the setting of 3½ will epilate the hair. Now if we are pausing between taps for a space of one second, we can see that the needle will have to be in the follicle for at least three seconds in all.

Step 6. Having determined the time factor, we can compute the galvanic meter reading. Since we need 45 units of lye for this medium depth hair and we are in the follicle for 3 seconds, then $(45 \div 3 = 15)$ 15 tenths is what our meter should indicate.

Step 7. Since you have probably removed the needle from the last follicle treated, it is now necessary to deaden the nerves of another follicle with high-frequency to set up the galvanic. Insert in a hair follicle similar to above, apply one second of high-frequency, delay one second, then apply another second. *Leave needle in place.* Epilate hair.

Step 8. Step on galvanic footswitch, adjust rheostat to make meter read 15 tenths (1.5 mas.). Do this quickly (less than 5 seconds) so that the patron will not feel anything.

Step 9. You are now set to apply both currents. Insert the needle in the next follicle and depress *both* footswitches. The galvanic switch must remain depressed, but you will release the high-frequency footswitch after one second, depress it again after another second and release it again after the third second. The galvanic is left on for a one-second after-count. Total time: four seconds.

The relationship of the currents can be seen in the time graph, Fig. 116. Try to think of your feet as rhythmically tapping out the pattern indicated on the graph in time with the counting of seconds. ("One thousand one, one thousand two, one thousand three, one thousand four.") You will be surprised to find how easily this will come to you.

Variations in the Body Technic

Variations in the body technic must always be adjusted in accordance with the units-of-lye formula, just as variations in the face technic are.

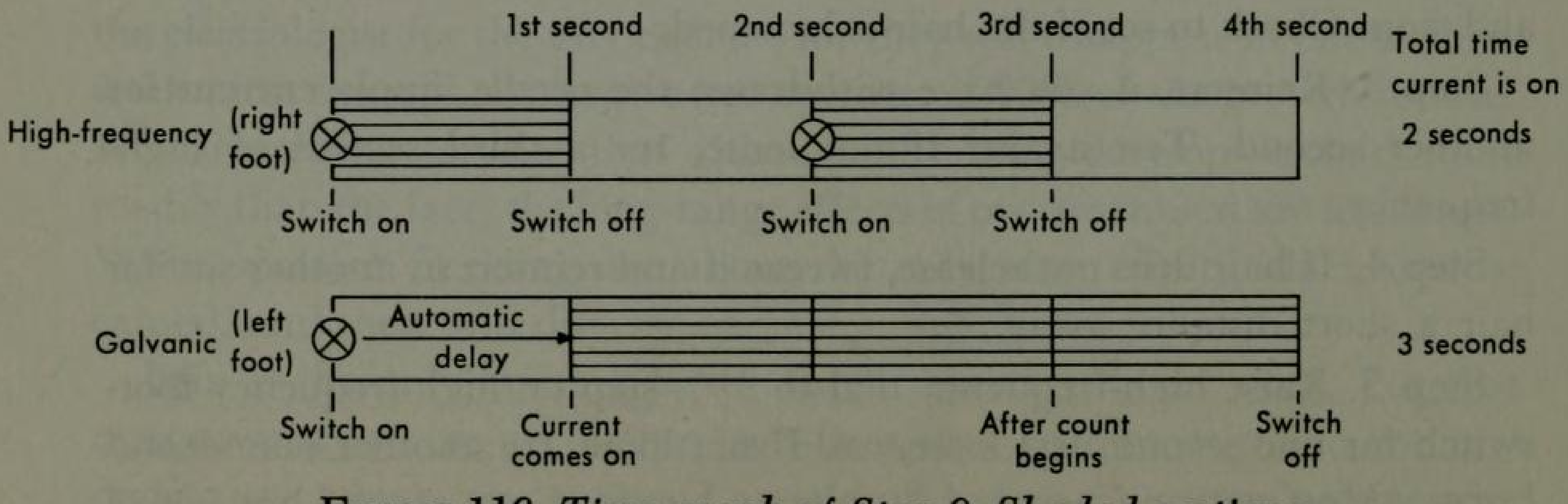

FIGURE 116. *Time graph of Step 9. Shaded sections indicate when current is on.*

But there is an additional factor in body variations which did not have to be considered for the face technic. Because of the higher intensities used on the body, the time pattern must be adjusted to accommodate the patron's nerve reactions. In the standard pattern offered above, high-frequency application was distributed over two one-second taps separated by one-second "rest" intervals. This is a pattern that is useable with "average" cases. But many situations are not average. The following variations are suggestions for treating typical problem situations (all utilizing the units-of-lye system):

Variation #1.

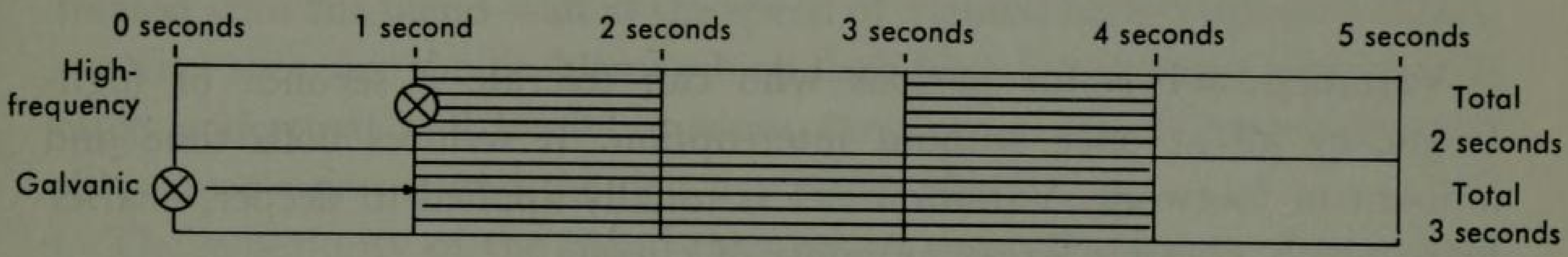

FIGURE 117. *Time graph variation #1.*

This variation is the speediest of them all. The galvanic pedal is depressed as insertion is started. Variation #1 can be used on people that are relatively insensitive.

Variation #2.

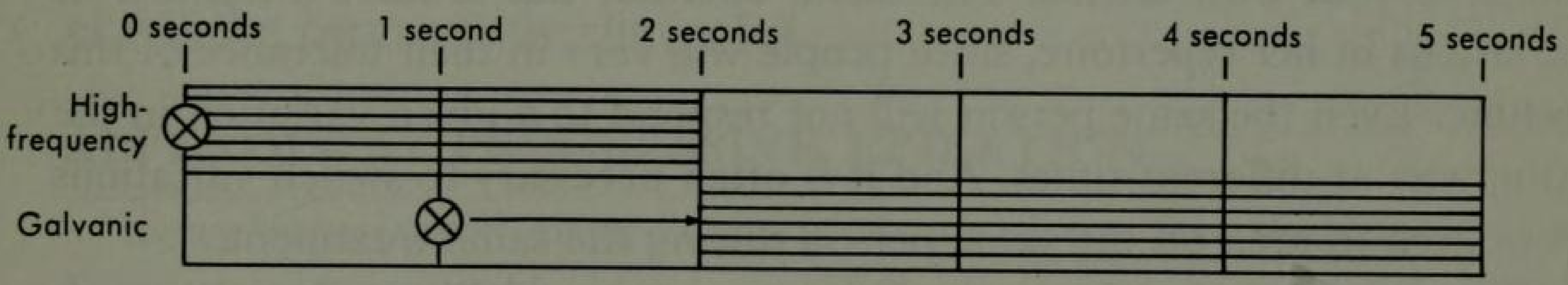

FIGURE 118. *Time graph variation #2.*

By applying the full quantity of high-frequency before introducing galvanic, you coagulate as much nerve tissue as possible before subjecting it to lye. This way the least galvanic-induced pain is felt. This method is best for patrons more sensitive to galvanic treatment than to high-frequency.

Variation #3.

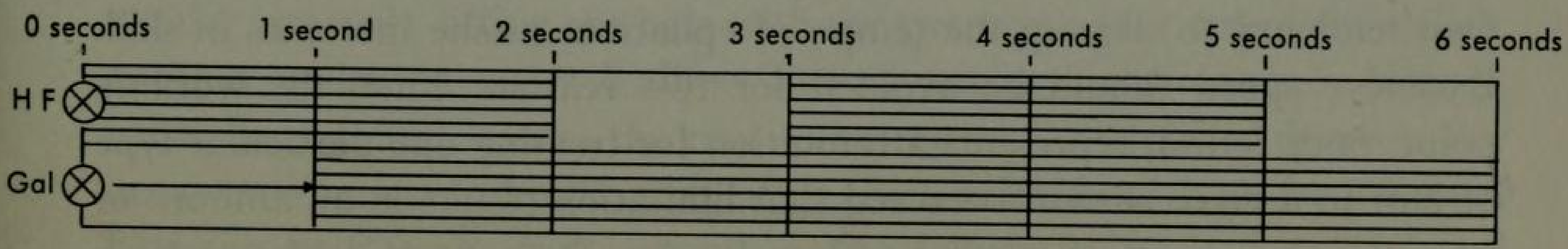

FIGURE 119. *Time graph variation #3.*

Variation #3 is similar to the standard body treatment except that it doubles the time of high-frequency. It is often needed on deeper and coarser hair, e.g., man's chest, back.

Variation #4.

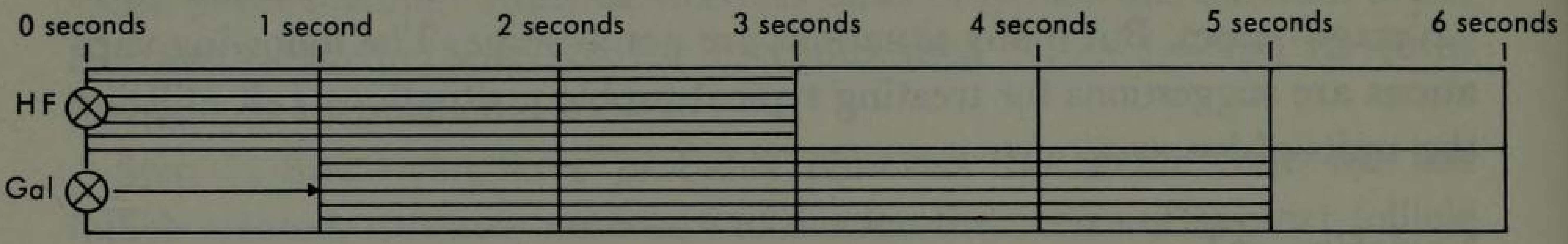

FIGURE 120. *Time graph variation #4.*

Variation #4 is for persons who can tolerate 3 seconds of high-frequency all at once without interruption. It reduces both time and amount of footwork. Variation #4 is usually applied to deeper, coarser hair, which requires larger amounts of current.

Developing Further Variations

The blended current technics explained in this chapter as well as the technics offered in the chapters on galvanic and high-frequency should be thought of as "teaching technics." With increased dexterity, skill and self confidence you will be able to evolve variations that are perhaps better suited to your own talents. The blend operator has to have a number of variations in her repertoire, since people will vary in their tolerance of this technic. Even the same person will not respond to a given variation in the same way at different times. And it is often necessary to switch variations from area to area on the same person during the same treatment.

The development of new variations must invariably be based on the units-of-lye system. Any attempt to employ the blend without this foundation is bound to result in a loss of thoroughness or speed. It is therefore better to master the standard technics before attempting any deviations. More than a year of constant practice is needed before an electrologist is in any position to develop new variations of the standard technics. Even then it is important to bear in mind the reasoning behind the technic when contemplating changes.

One pitfall of which the electrologist must be constantly mindful is her own tendency to step up the tempo of epilations as she increases in skill. Excessive speed should be avoided for two reasons. First, the working point, once found, represents a limitation for treating one particular type of hair in a given area. To exceed that limitation results in an amount of pain which the patron cannot endure for very long. It may also cause a breakdown in the surface of the skin. Second, the electrologist herself cannot operate at maximum speed continuously. She eventually winds up taking time to "catch her breath" from the madcap pace. The time gained by the rapid method is thereby lost. It is far better to establish a tempo which is comfortable to both electrologist and patron. This, in the long run, proves to be the most efficient course of action.

Summary

The great advantages of the blend over other technics is its versatility, its ability to tackle almost any epilation problem that arises. Curved follicles, near misses and deep difficult bulbous hair can all be thoroughly treated with the blend—all at the speed of manual high-frequency. These, we have seen, are the problems which flash high-frequency operators must often undertreat and forcibly tweeze, simply because of the sensitivity of the patron's nerves and the delicacy of her skin.

The superiority of the blend thus lies in the permanence of its effects. The blend may be slightly slower than the flash technic—it removes from 200 to 600 hairs per hour, depending on the type and location of the growth—but the percentage of regrowth after blend treatment is significantly smaller. In the long run the blend requires fewer hours to "clear" an area permanently and is therefore less expensive to the patron than either the flash or manual high-frequency technics. The true criterion of a technic is not the number of hairs removed per hour, but the number of follicles permanently eliminated.

APPENDIX A: PROGRESSIVE EPILATION

Every experienced electrologist is aware of the fact that deep coarse hair in a soft moist skin is the most difficult of cases to treat because the skin surface often breaks down before the hair completely releases. This is because the high-frequency heating pattern tends to climb to the surface before the electrologist is aware of it. Progressive epilation is a technic which enables the electrologist to follow the rise of the high-frequency heating pattern and epilate the hair just before the destructive pattern can blister the epidermis. This method is thus of great assistance to both manual high-frequency and blend operators.

The progressive epilation method consists simply in testing the hair at regular intervals, lifting the hair with the tweezers as far out of the follicle as the coagulated tissue will allow. The advancing high-frequency pattern, it has been found, causes the root to be released in steps or degrees. For instance, you may observe that after three seconds of high-frequency a hair can be lifted a short distance in the follicle before it "catches" and starts to raise the skin around it. After another three seconds the hair can be lifted out a greater distance before the adjacent skin rises. Each lift should bring the hair root further out of the follicle than the previous lift. By progressively epilating the hair, the electrologist is "feeling" the high-frequency heating pattern as it "cooks" its way upward. The final lift will remove the hair from the follicle just before the cooking has advanced to a dangerous level.

The manner in which the hair is lifted is crucial to the technic. The tweezers should be kept in the free hand so that the current need not be interrupted each time the hair is tested. Following each lift the hair should be returned to its original depth, the tension being relaxed between lifts. If this is not done the follicle will stay "balled up" around the root, making removal very difficult. Another thing to remember when lifting; do not pull so hard that the skin surface is raised; this is painful to the patron. The technic relies on a good sense of touch and delicate handling.

Once the root of the hair has been lifted into the upper portion of the follicle the operator will feel some traction but the patron will not. Apparently the forcible rupturing of tissue in the upper half of the follicle does not give the patron the tweezing sensation that it does in the *lower half* of the follicle. This must be due to the fact that the nerve plexus is located near the middle of the anagen follicle. During progressive epilation, therefore, the patron will feel the epilation only if the root has retained some attachment to the lower section of the follicle.

A skilled electrologist should not allow her patron to feel hair being tweezed in the normal course of the treatment even though she may experience traction with most of them. Ask your patron if she feels any hair

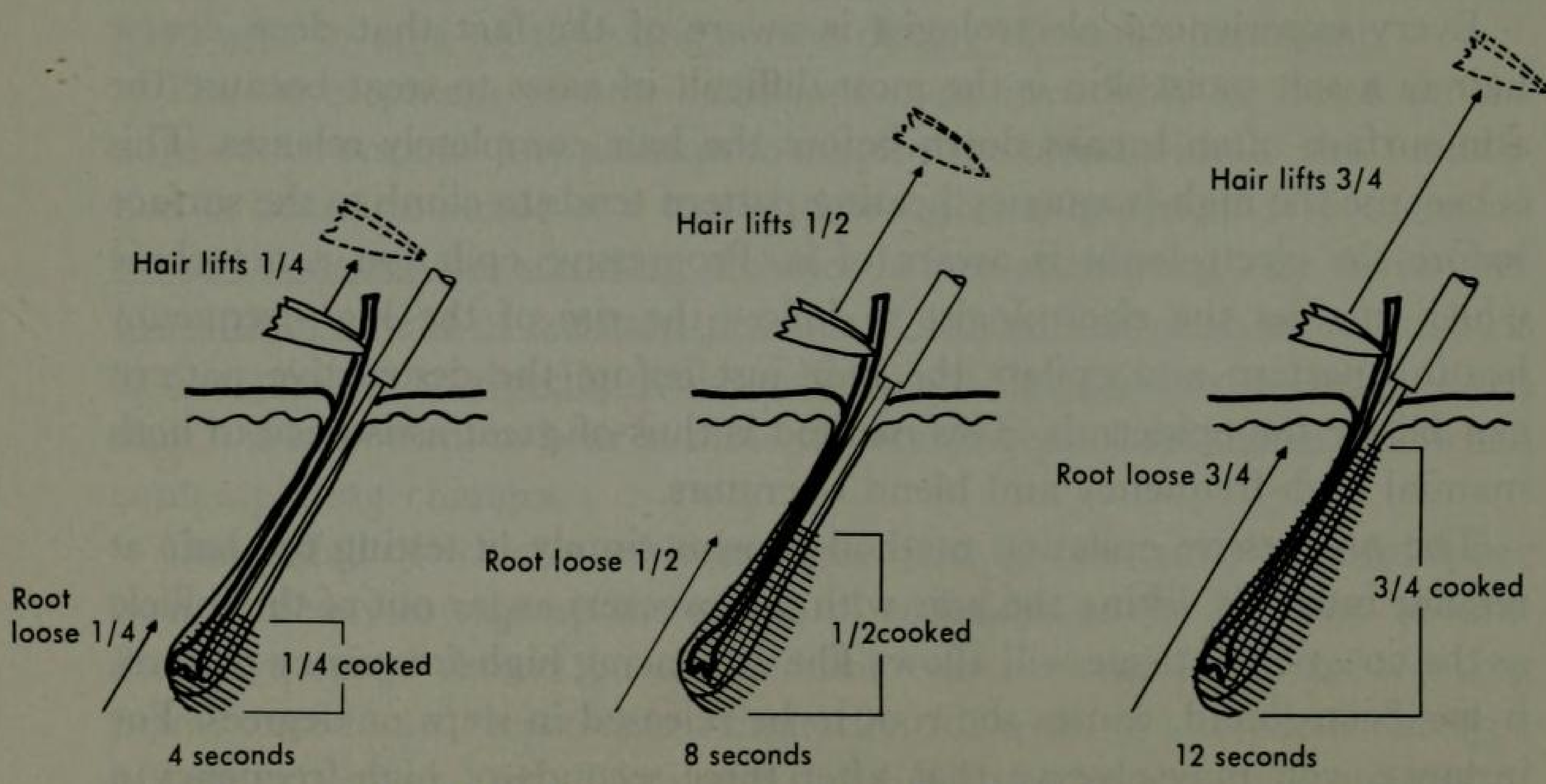

FIGURE 121. *Hair looseness as related to high-frequency pattern.*

being pulled. If she does, check your insertion depth and the intensity of the high-frequency current. A felt tweeze means that you have failed to coagulate enough tissue to lift the hair out of the lower portion of the follicle. The hair root should have progressed to a level just beneath the surface of the skin when you finally epilate it.

Progressive Epilation As Practiced on Normal Skin

If the patron's skin is normal in moisture content and elasticity, it will not be necessary for the electrologist to test the hair until half or three fourths of the total time in the follicle has elapsed. For instance, if hairs of a certain type are found to release completely in twelve seconds, then make your first lift at nine seconds to test for looseness. If the hair does not release, return it to its original depth, epilating it at the usual twelve seconds. In either case, be sure to apply the normal after count of galvanic after the hair has been epilated.

Progressive Epilation As Practiced on Soft Moist Skin

Soft moist skins require more "lifts" of the hair than normal skins, but the number of lifts and the time to make them depends a good deal on the judgment of the operator. If, after several lifts, you judge the root of the hair to be about three fourths of the way out of the follicle, epilate the hair, even if insufficient high-frequency current has been applied to the follicle. In the case of ordinary high-frequency treatment, you will have saved the skin but you cannot be sure that you have permanently destroyed the follicle. When using the blend, you should give the follicle enough of an after count to provide the follicle with the required total of units-of-lye. This will produce sufficient chemical decomposition in the lower portion of the follicle without causing harm to the surface.

Progressive epilation is a difficult technic to master but it is an important item in the blend operator's arsenal of technics, especially when it comes to the deep hairs in moist skins. Only time and practice will give you this necessary skill. At first you will be testing the hair every two or three seconds until you get the "feel" for the technic. With experience you will find that only the first few hairs in an area need to be tested so frequently. Your own sense of timing will then tell you how soon after insertion you should begin testing. The important thing is to be able to remove the hair and stop the high-frequency before it does surface damage. Additional galvanic will compensate for the early epilation.

Progressive Epilation As a Guide to Accurate Insertions

Another advantage to progressive epilation is its early warning that an insertion is inaccurate. Working in a given area will give you an idea as to how long a given type of hair requires for partial release. Suppose, for instance, that hairs you have been treating in a certain area have been coming half way out of the follicle in six seconds. If you come across a similar hair which fails to loosen within six seconds, you know that either you have missed the follicle entirely or that the hair is growing from a follicle in telogen. In such an event stop everything and reinsert, beginning all over with the new insertion. (If you had not discovered the inaccuracy until after a full application of current, a second attempt could not be made because of the danger of overtreatment.)

If for some reason the hair should not release on the second try, it should be tweezed to avoid returning to it by mistake and overtreating it. Explain to the patron that you will have to tweeze this particular hair to prevent the possibility of causing a scab or blister.

APPENDIX B: GALVANIC COMPUTATION TABLE

The following table is provided for those students who have difficulty performing the necessary computations to obtain the correct galvanic setting for the blend. After determining the type of hair and the amount of time needed to epilate such hairs, you need merely adjust your machine to the number of ma. indicated in the table.

Shallow Insertion e.g. upper lip lanugo hair only	**Medium Insertion** e.g. side face, arm, average chin	**Deep Insertion** e.g. chin, back, arms, legs, etc.	**Very Deep Insertion** e.g. man's beard, arms, thighs, back.
Quantity— 15 units	**Quantity— 45 units**	**Quantity— 60 units**	**Quantity— 80 units**
Sec. Ma.	Sec. Ma.	Sec. Ma.	Sec. Ma.
5 use .3	15 use .3	15 use .4	20 use .4
4 use .4	11 use .4	12 use .5	18 use .5
3 use .5	9 use .5	10 use .6	16 use .5
	7 use .6	9 use .7	14 use .6
	6 use .7	7 use .8	12 use .7
	5 use .9	6 use 1.0	10 use .8
	4 use 1.1	5 use 1.2	8 use 1.0
		4 use 1.5	7 use 1.1
			6 use 1.3
			5 use 1.6
			4 use 2.0

APPENDIX C: TREATING DOUBLE AND TRIPLE HAIR PATTERNS

Student electrologists quickly discover that body hair does not always grow in single patterns. Follicles often appear in close groups of two or three throughout a given area on certain patrons. For instance, one may find a recurrent triple pattern in which a shallow follicle is flanked by two deep ones. Or again, one might consistently find a double pattern of one deep and one shallow follicle. The peculiar thing about such groupings is the repetition of these depth relations throughout the area.

Some scientists reason that double and triple hair patterns are an evolutionary holdover from the reptile stage of animal development, the groupings being roughly analogous to certain scale formations on our more slithery kin. While leaving this hypothesis open to question, we should like to point out that the consistency of patterns in an area does make uniform treatment possible. The major advantage to these patterns is that each can be treated as a unit, with the same treatment tactics transferable from unit to unit. Since these tactics must be specially tailored to the type of pattern encountered, it is only possible to examine here the reasoning upon which these tactics must be based. It will be up to you to develop the specific strategy required for the many types of patterns you will encounter.

The important thing to bear in mind is that double and triple hair patterns must be treated as a unit if all of the hairs are to be treated at a given setting. Because of the close proximity of these follicles, consecutive treatment of each hair with a standard amount of current would result in an overlapping of destructive patterns, with the surface epidermis thus becoming overtreated. **Treating multiple patterns as a unit is primarily for body work.**

Double Patterns

The number of variations in the double pattern is limited and therefore easy to work with. Either both are the same depth or one is deeper than the other (see Fig. 122). When both are the same, a full treatment can

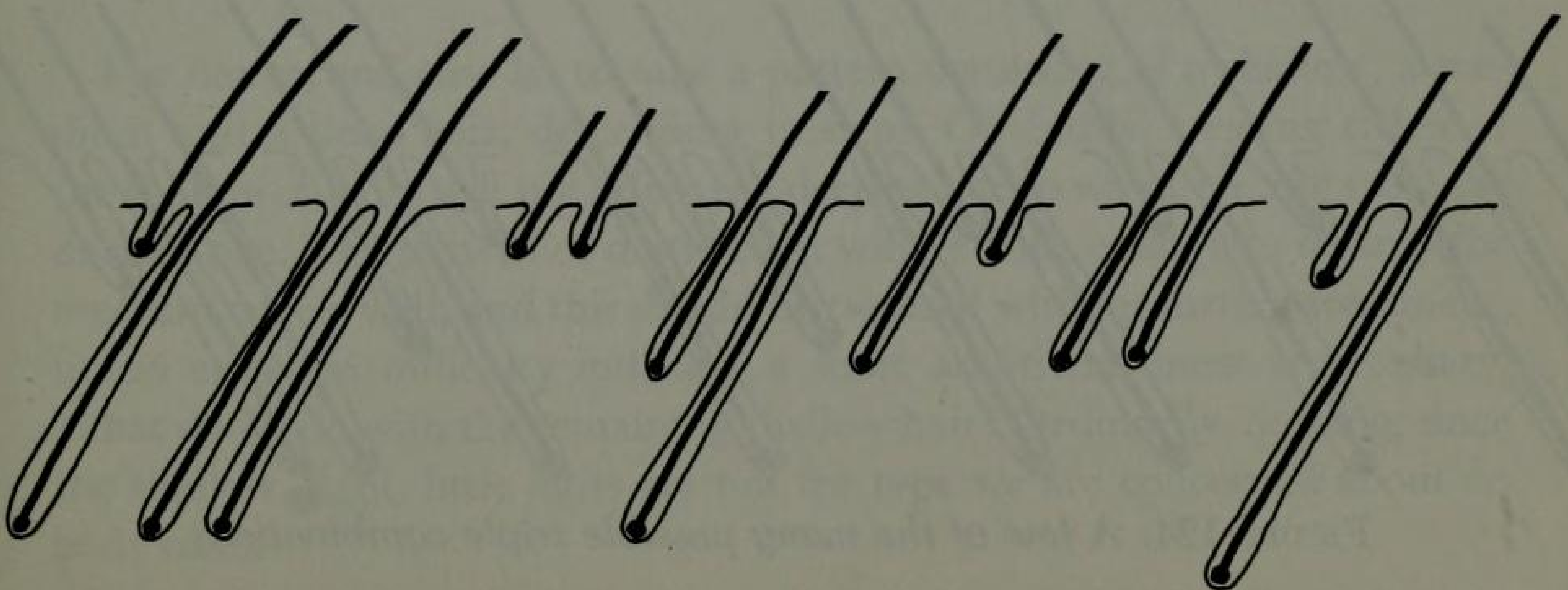

FIGURE 122. *Some sample combinations found with the double pattern.*

be given to one followed by a partial treatment of the second. If the follicles are parallel the first treatment will have already destroyed a portion of the second follicle.

When one follicle is considerably deeper than its mate, a full treatment of the deeper one will often finish off the shallow one as well. You will have to experiment with these patterns to see whether this is sufficient. Sometimes a short extra burst in the shallower follicle is all that is needed to release the second hair. Other combinations will require their own special strategy in accordance with their proximity and depth relation. (The depth is judged, of course, by the pigmentation and the thickness of the hair. If the patron has been shaving, greater length will denote the deeper hair.)

Triple Patterns

An interesting feature of the triple pattern is that the follicles are almost always lined up in a row. Furthermore, these rows are usually all laid out in the same direction within a specific area (as are the double patterns). The correct direction of insertion for such triple patterns, it has been found, is at right angles (90°) to this line of follicles. All three follicles in the pattern, it seems, emerge from the epidermis roughly parallel to each other in this direction.

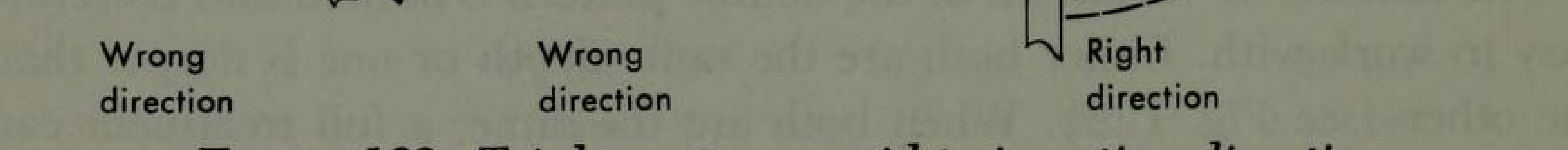

FIGURE 123. *Triple pattern as aid to insertion direction.*

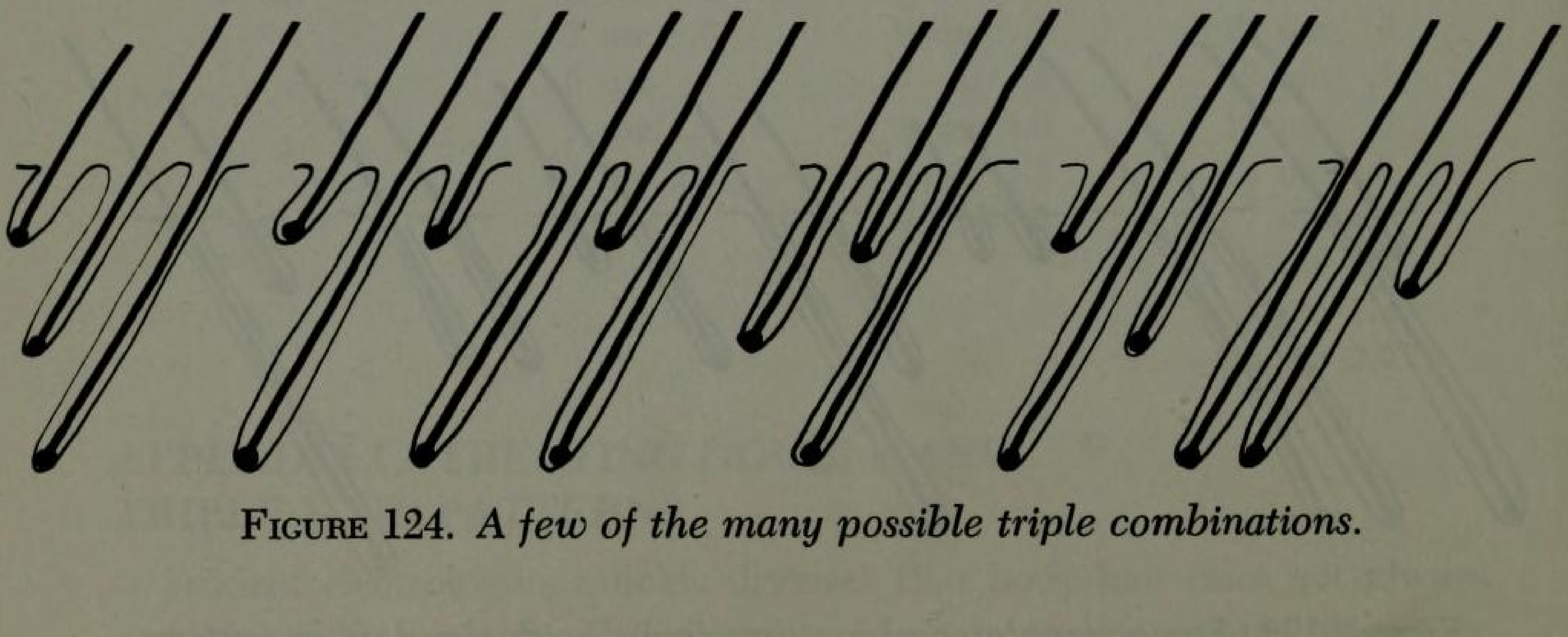

FIGURE 124. *A few of the many possible triple combinations.*

With an additional follicle in the group, the number of possible variations among triple patterns is far greater than it is for double patterns. Deep follicles can flank a shallower one, shallow ones can flank a deep one, all can be of the same depth or all can be of different depths. Triple patterns require a great deal of ingenuity.

Three hypothetical examples will show the type of reasoning which must go into treating the triple pattern as a unit. After that the student is on her own.

The first of these cases involves a pattern of two deep follicles flanking a shallow one. What we want is a system of destructive patterns that will take out all three hairs. Since treatment of the shallow follicle will not effect the deeper follicles the best plan of action is to treat the two deeper follicles. The shallower-growing hair can then be tweezed, since the bridging patterns would have destroyed its vital parts. It is often possible to epilate all three hairs with one grip of the tweezers.

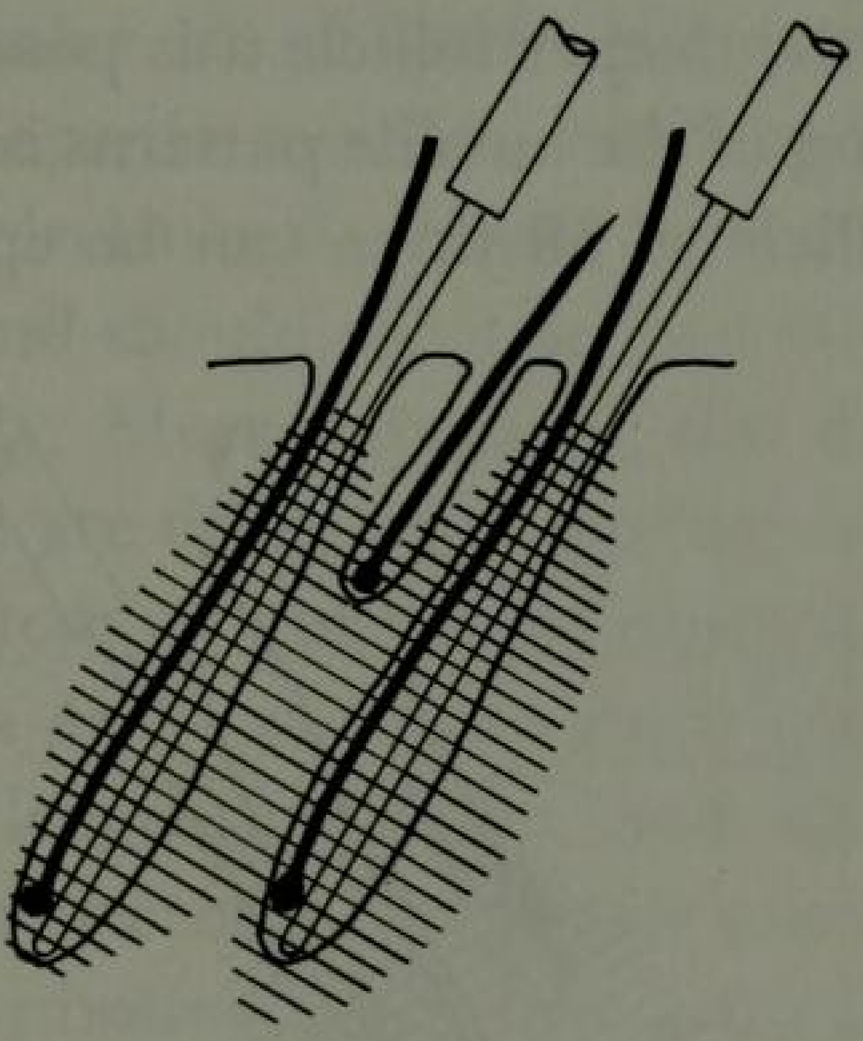

FIGURE 125. *Treat two—epilate three.*

For our second case let us take a pattern consisting of a shallow, a medium and a deep hair, descending in steps. Obviously, treating either of the shallower hairs will not effect the deepest one so we insert and treat the deepest one. The pattern of destruction will be wide enough to destroy the medium one as well, and this should be tweezed without further treatment, unless epilation difficulty indicates a short additional burst is necessary. What do we do with the remaining shallow hair? Ordinarily, nothing, since the shallow, light, little hairs are not the type we are concerned about on body cases.

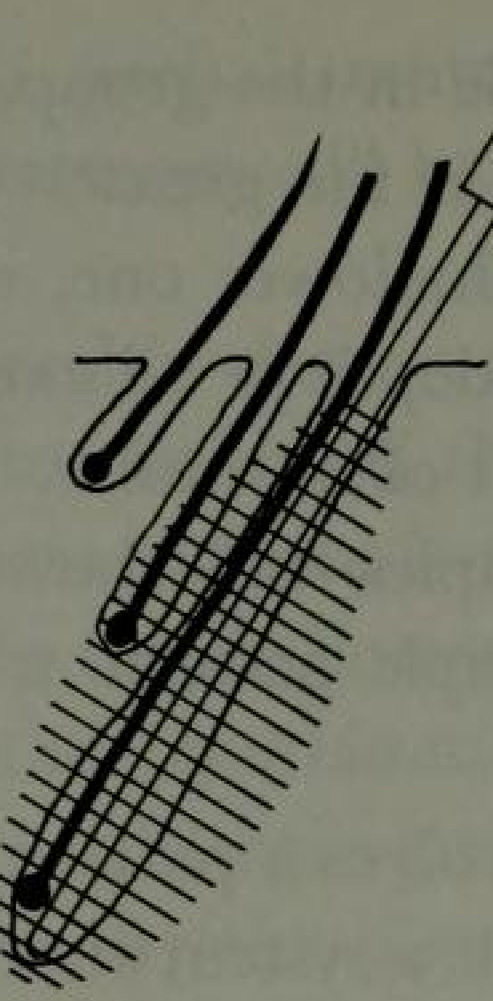

FIGURE 126. *Treat one—epilate two.*

Our final example involves two medium follicles flanking a deep one. Now the chances of sufficiently treating both of the outside follicles by inserting in the deep middle one are small, since the insertion is apt to be off to one side or the other. However, by inserting in each of the shallower follicles to the depth of the deeper follicle it is possible to bag three for the price of two. Overlapping of the outside patterns is apt to provide sufficient action in the center follicle so all three can be epilated with one grip of the tweezers.

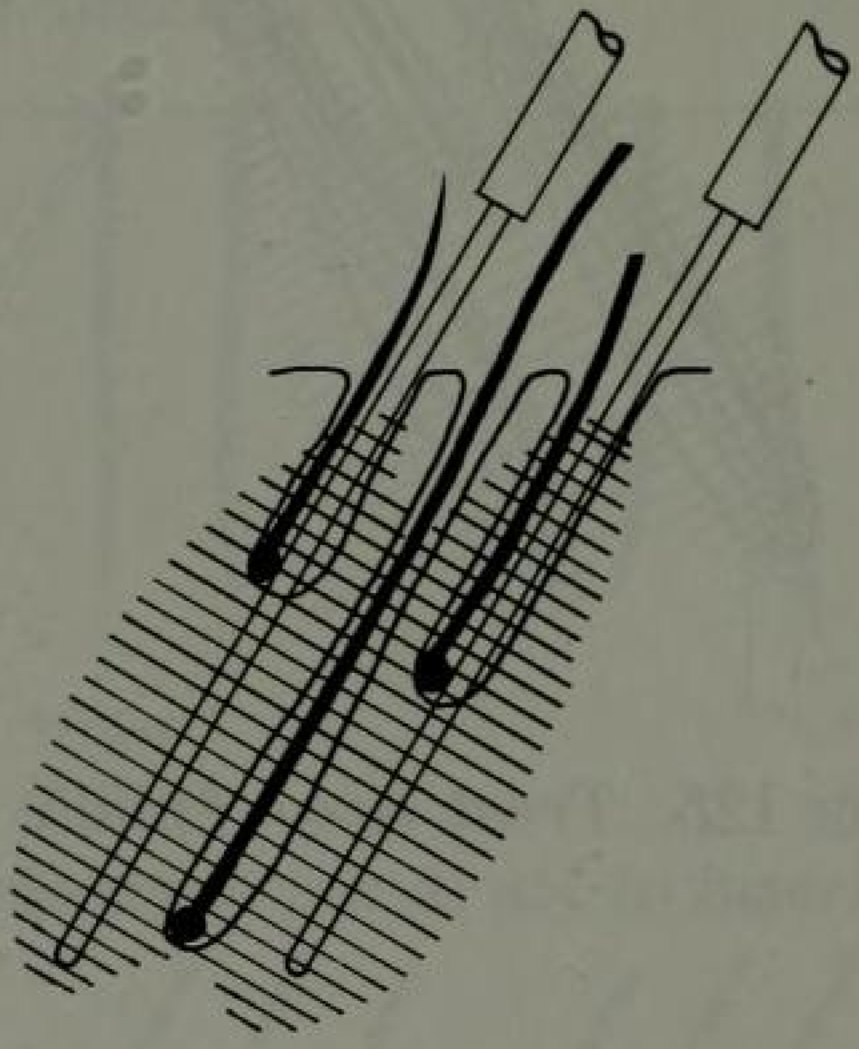

FIGURE 127. *Treat two—epilate three.*

Chapter XI

The Needle

The needle is the electrologist's most important piece of equipment, and yet it can be the piece most often ignored. Small as it is, a poorly constructed or improperly cared-for needle can mean disaster. It is sad to see an electrologist worrying about every detail from advertising to decor while lacking the slightest qualm about performing with bent, mutilated or misshapen needles. Perhaps the needle's diminutive size is the reason it is so often ignored. Every electrologist should possess a 10 power magnifying glass or jewelers loupe and should use it at least once a day to take a good look at her needle supply. More important, she should be careful to buy only those needles which are designed to perform correctly.

To be a well constructed, well cared-for instrument, the needle must be able to perform both as a *probe* and as an *electrode.* As a probe, the needle must have the proper length, diameter, and tip for making accurate, efficient insertions. As an electrode, the needle requires the right diameter, length and shape for distributing adequate electrical action throughout the limited area of the lower portion of the follicle without overtreating the epidermis or the nerves. The history of needle development demonstrates a slow but steady progress towards fulfillment of these special requirements. For users of the blend and the manual high-frequency technic, the *tapered needle* comes closest to fulfilling the demands of deep, difficult hair problems.

History of Needle Types

Early medical needles. In 1875 when Dr. Michel did his first experiments with galvanic electrolysis, he used the needle common to the medical profession. Made almost exactly like a sewing needle, it had a shank that fit into a special needle holder or handle designed by surgical equipment manufacturers for use with their equipment. Because sewing machine needles were already being produced in large numbers, manufacturers probably modified the existing product by leaving out the needle eye, rather than go to the expense of developing a specialized needle for the medical profession. As a result of the precedent set in those early times, the two-piece electrologist's needle still has a shank of the same size as a sewing machine needle. In Dr. Michel's day the shaft was about 1 inch long and the last ¼ inch of it was tapered off like a common hand sewing needle as shown in Fig. 128.

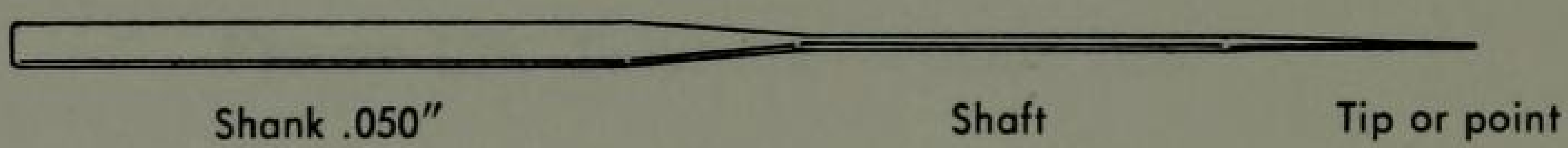

FIGURE 128. *Early Electro-medical needle.*

The medical profession even to this day use needles much larger in diameter than those of the electrologist, but of course, the doctor's purpose is somewhat different from the electrologist's. Since the doctor is mainly concerned with removal of warts and moles either by galvanic or electrosurgery, he does not require a needle diameter smaller than .010″, which is very large by our standards. Even if he is removing hair prior to a "hairy mole" removal he usually gives an anesthetizing injection around the mole beforehand. Under these conditions the deep coarse hair follicles can easily accept the large needle diameter. The excision or electro-desiccation of the mole itself will take care of the shallow follicles.

Unfortunately, when the multiple needle electrolysis method was developed, the needles used by the medical profession were the ones adopted for use. The shortcomings of this kind of needle were soon detected (it posed an enormous problem of inserting, for example), and other needle shapes were tried out. As the years passed there was a gradual decrease in the diameter of the needle's shaft, which required a shortening of the shaft length to make it more durable.

The bulbous needle. One interesting attempt to save the epidermis was the bulbous needle. It was first conceived when sewing machine needles were still in vogue. The original ones appeared in the shape shown in Fig. 129.

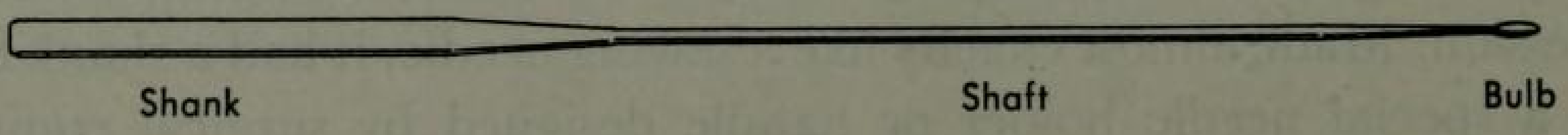

FIGURE 129. *Early bulbous needle.*

The end was not a little ball as one might imagine but rather an expanded, elongated section of the last 1/16 inch of the needle. The purpose of this design was to cause extensive electrical contact with the tissue at the lower part of the follicle without affecting the upper part seriously. This it did very well, and because of its large bulb, it usually did not pierce the follicle side-walls. This latter feature enabled the operator to feel the follicle bottom more readily.

In its original design the bulbous needle was very effective for galvanic treatment, but because of the trend to generally smaller diameters the ratio between the bulb-diameter and the shaft diameter in present-day bulbous needles has become so small that the electrical effectiveness of the bulbous tip is insignificant. Those of recent manufacture are valuable, however, as a probe with a well-rounded point—an important factor.

The coated needle. The needle shaft has been experimented with over the years and several investigators have made valuable contributions. Dr. M. H. Marton pioneered the development of the coated needle in electrolysis. Its purpose was to expose to the tissue only the last ⅛ inch or so of the metal, the upper part of the shaft being covered by an insulating coating that prevented the sodium hydroxide from acting on the epidermis. The coating increased the diameter of the needle, but for the doctor's purpose it posed no problems.

Coated needles were and are an attempt to solve the problem of surface overtreatment. They are more effective with galvanic currents than with high-frequency because the high-frequency field is not affected by insulation. There is some reduction of the high frequency heating, however, because the additional coating spaces the tissue away from the needle. Unhappily, an insulating coat thick enough to be useful in this regard makes the needle diameter too large for easy insertion.

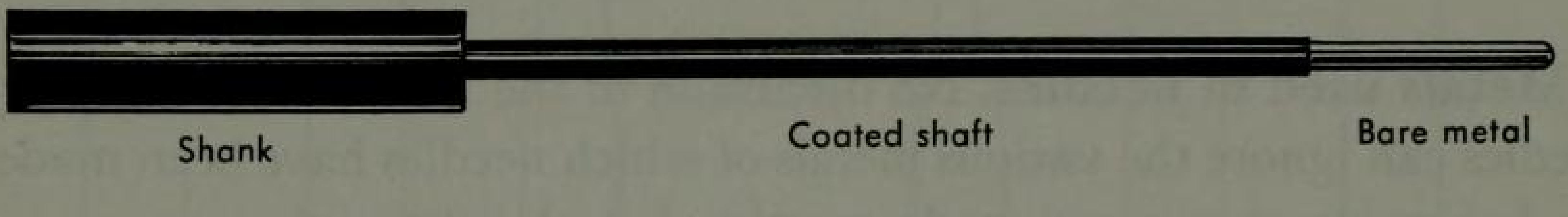

FIGURE 130. *Insulated or coated needle.*

The two-piece needle. In the early 1930's the two-piece needle became popular with multiple-needle electrologists because its structure allowed for a very fine shaft. Electrologists had come to realize that smaller-diameter needles insert more easily into the follicle with less irritation to the patron. They also produced less evidence of sub-surface scar tissue formation.

When the high-frequency method entered the field it was natural to adopt the same needle that was in use by multiple-needle operators. With

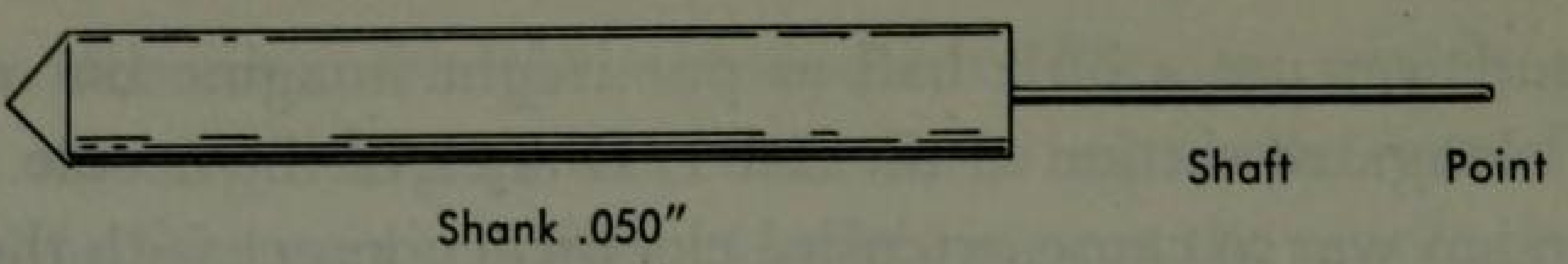

FIGURE 131. *Two piece needle.*

some exceptions, such as the screw-on shank, little has changed in the two-piece needle, which is still in use today.

The tapered needle (A one-piece needle). For both high-frequency and the blend technic, the tapered needle has a most effective design for preventing surface overtreatment.* Oddly enough, its importance as an electrode was discovered only after the tapered shape had been developed for quite another purpose. Seeking something not so easily broken as the two-piece needle, which, prior to the advent of stainless steel, always had a weak spot where the pieces joined, several California electrologists experimented with one-piece needles with shafts that tapered to the desired diameter. This, they found, was superior to the short lengths of .004″ or .005″ steel piano wire popular among many electrologists at the time. For years the tapered needle was appreciated only for its value as a probe. Its benefit as an electrode which cuts down on the surface action came to light only through extensive experience with it. To understand the effectiveness of the tapered needle, as well as other special needles which may be developed in the future, it is necessary that we discuss in detail the physical and electrical requirements which a good needle must fulfill (to be taken up in later sections).

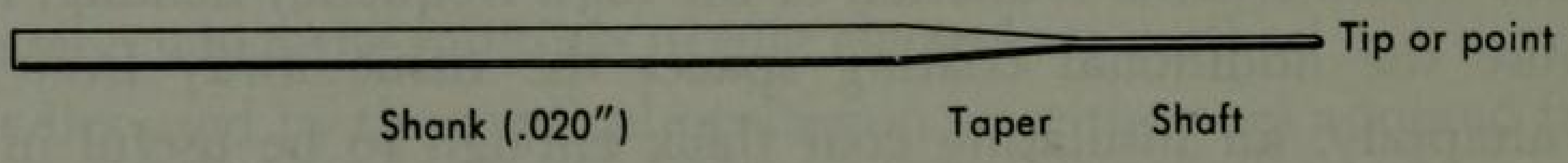

FIGURE 132. *The one-piece or tapered needle.*

Metals used in needles. No discussion of the historical background of needles can ignore the various metals of which needles have been made. In the beginning they were made mostly of steel (although copper needles were common for positive galvanic application). Later, innovators introduced gold and platinum alloys which were superior to ordinary steel because they did not rust. They were also valuable because they would not tattoo the patron's skin with black deposits if the operator mistakenly used the needle at the positive pole.

With the advent of good grades of stainless steel, a rustless and more durable needle is now being produced in both the one- and two-piece types.

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*There is no patent on the tapered needle; any manufacturer is free to produce it.

The stainless steel needle must be used with the negative pole only, because it too will leave a black mark if used with the wrong polarity. Most modern equipment is designed to prevent mistakes of polarity, so this is ceasing to be a problem. The majority of needles in use today are made of stainless steel.

The Needle as a Probe

Important factors in the needle's performance as a probe are: (1) the diameter, (2) the length and (3) the shape of the tip.

Diameter. A needle's first task is to enter the pore and slide down into the follicle. Its diameter should therefore be small enough to permit easy access and yet be great enough to give the needle sufficient sturdiness. It has been found that needles of about the same diameter as the hair will slide easily into the follicle opening, requiring little or no push to get the tip of the needle to the follicle bottom. Needles which range in diameter from .005″ to .002″ (the thickness range of average hairs) have satisfactory toughness if constructed of stainless steel of which, as we have said, nearly all needle shafts are constructed nowadays.

Tip. The shape of the needle's tip is important in helping you "feel" your way to the bottom of the follicle. A sharp point would go right through the bottom of the follicle without notice. A proper point for a needle is rounded like the tip of your finger. It should not be pointed like a bayonet nor should it be squared off as in Fig. 133. The patron should not feel the insertion if the point is right. (Of course you must be entering the follicle at the right angle.) A bright, polished needle will enter the follicle more readily with a smoother feel of insertion than a rough or dull one.

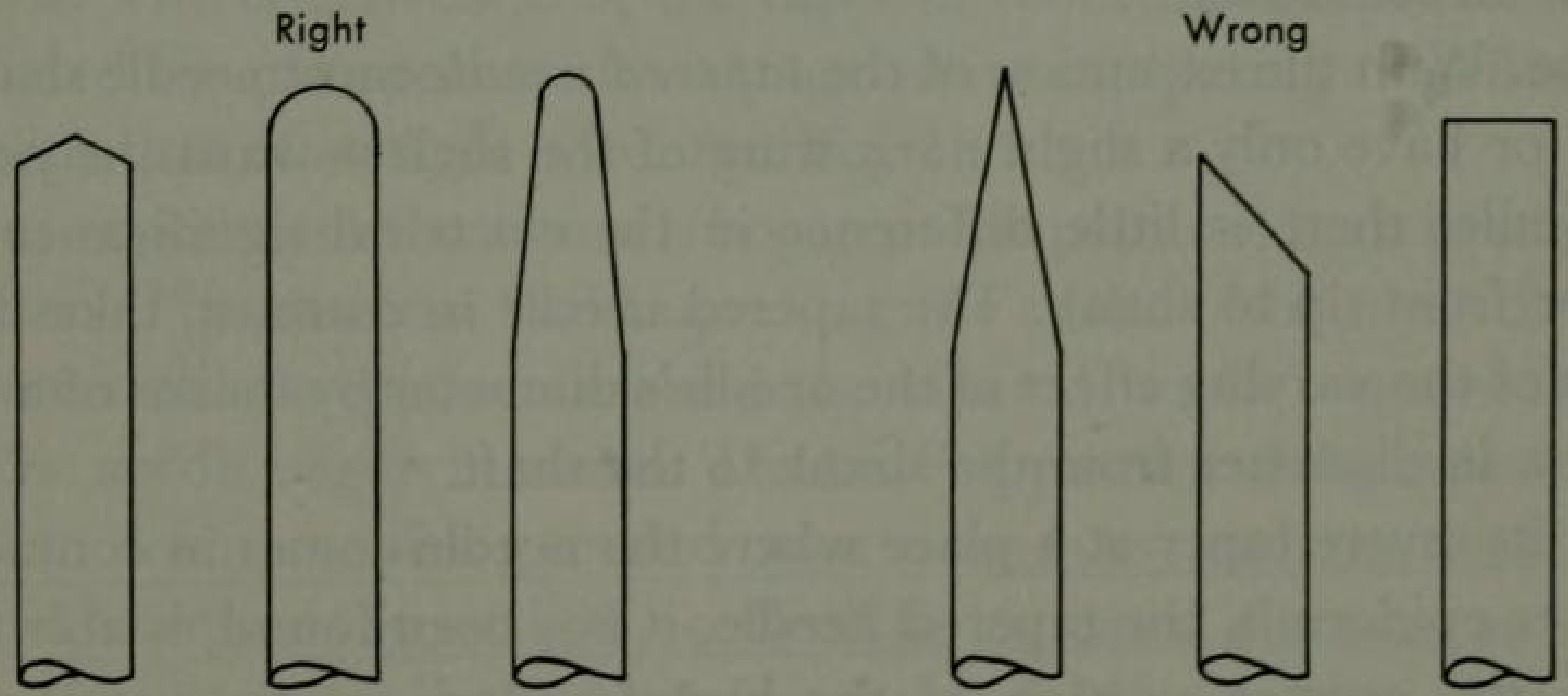

FIGURE 133. *Shape of needle tips.*

Length. The length of the needle should be determined by the depth of the hairs being treated. It is therefore wise to keep in stock a variety of needle sizes. Each manufacturer has his own way of designating needle sizes. Some have an exact description for both length and diameter such as ¼″ length, .005″ diameter. Hand-ground tapered needles are not easily graded to exact dimensions, so lengths are usually designated as A, B, C, D and diameters as small, medium and large.

The Needle as an Electrode

There are three factors which determine the electrical performance of the needle: (1) length, (2) diameter and (3) shape.

Length. Proper length is important because it will enable the accurate placement of electrical action in the follicle. A needle which is too short is ineffective because it will not carry the high-frequency field or galvanic lye down to the level of the deeper papillas. The needle must be long enough to reach the full depth of the type of hair being treated in the deepest stage of anagen.

Diameter. Diameter is also an important factor because it affects the degree and distribution of electrical action around the needle. Experiments outlined in Chapters VIII and IX, have made it clear that the activity of both the galvanic and high-frequency currents is affected by the diameter of the needle. Galvanic current, it was found, distributes its effect evenly throughout the entire surface of the needle; therefore that portion of the needle having the greatest area (i.e. the largest diameter) transmits the greatest amount of current. For high-frequency the reverse was found to be the case; the greater the diameter of the needle the less intense is the field produced by a given amount of current. For either current, however, a needle of the same diameter as the hair does the job well. Thus, the diameter required of the needle as a probe is in most cases also satisfactory for the needle as an electrode.

Shape. With the exception of the *tapered needle* most needle shapes are straight or have only a slight narrowing of the shaft toward the point. In such needles there is little difference in the electrical significance of the diameter from tip to shank. The tapered needle in contrast, takes full advantage of the varying effect of the needle's diameter by means of a radical reduction in diameter from the shank to the shaft.

With its severe taper at a place where the needle comes in contact with the upper epidermis, the tapered needle, it has been found, is able to concentrate the greater portion of the high-frequency action at the lower section of the shaft without overtreating the upper layers of the epidermis. This is of great assistance when working on the deep-growing hairs which require extensive treatment with manual high-frequency or the blend. To appreciate how the tapered needle works, let us compare its action with that of a "straight" needle for both galvanic and high-frequency currents.

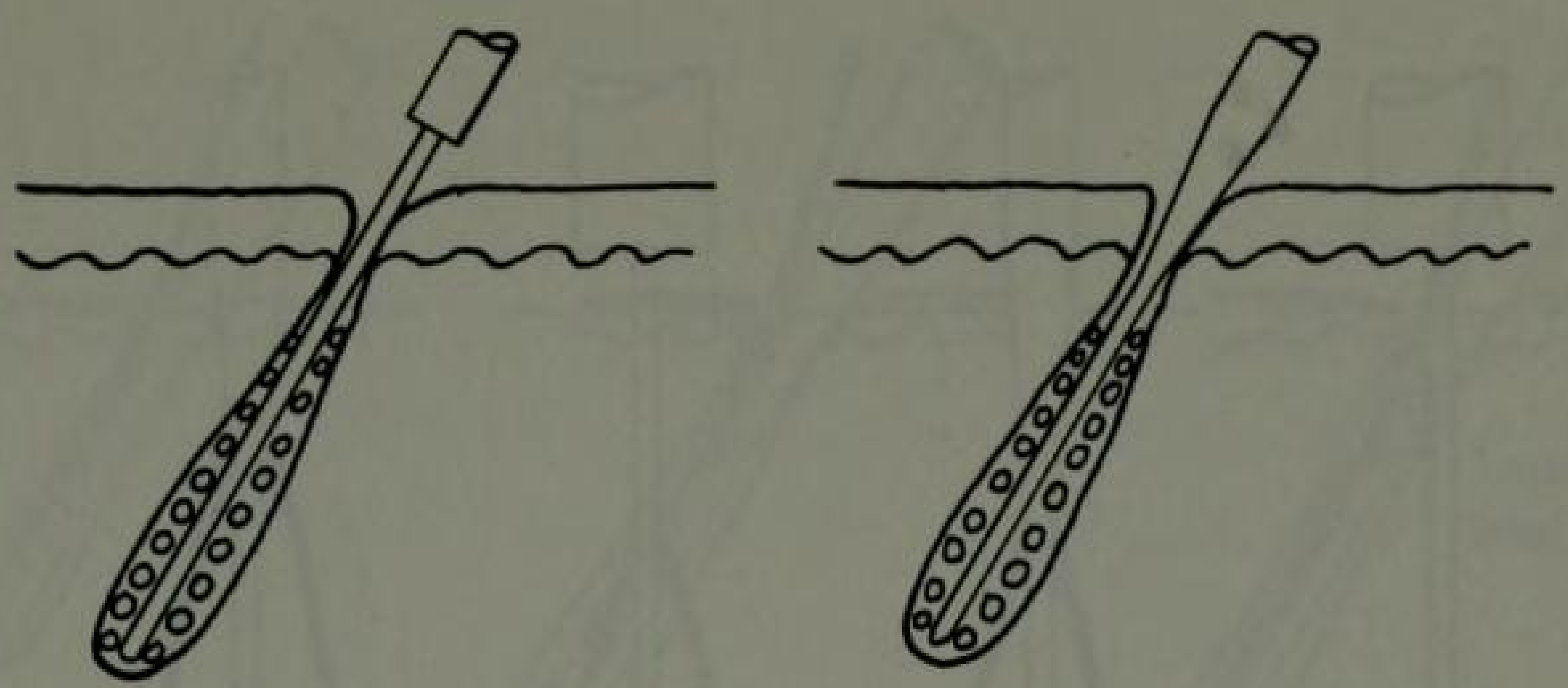

FIGURE 134. *Comparison of galvanic action on straight versus tapered needle in tissue.*

Comparison of Straight and Tapered Electrodes

Galvanic current. The tapered section of the needle is not of any use at all when using galvanic current alone, since it tends to place most of the conducting surface at the upper portion of the follicle. The old bulbous needle was much better for galvanic distribution since it placed most of the action at the bottom, where it belongs. Galvanic current should therefore be used with tapered needles only when it is part of the blend, which benefits from the tapered needle. Because of the short amount of time required by the blend, the needle is out of the follicle before moisture around the wider part of the needle can be transformed into a significant amount of lye. There is no overtreatment problem here.

High-Frequency current. The great advantage of the taper is its effect on the heating pattern induced by high-frequency. Without the tapered needle very soft, moist skins with deep, coarse hair could not be handled adequately by the blend. In these deep-moist cases the high-frequency pattern frequently rises to a dangerous level before the follicle is sufficiently destroyed. The effectiveness of the taper in reducing this problem can be appreciated by an experiment with egg white comparing the effect at the taper with that of straight wire. See Fig. 135.

In our experiment the action is begun at the points of both needles at the same time. The patterns build up along the shafts of both needles at the same rate until the pattern around the tapered needle reaches the point where the needle begins to widen. The heating pattern of the tapered needle then slows down, requiring several more seconds to reach the top than does the pattern around the straight needle. The increased diameter at the taper reduces the intensity of the high-frequency field around it. The pattern produced by the tapered needle will eventually reach the surface, of course, but this delay of several seconds is all the electrologist needs to treat the follicle thoroughly. In those special cases where a lengthy treatment is required (deep, moist follicles) this delay will save the epidermis from what would have been unsightly water blisters and scabs.

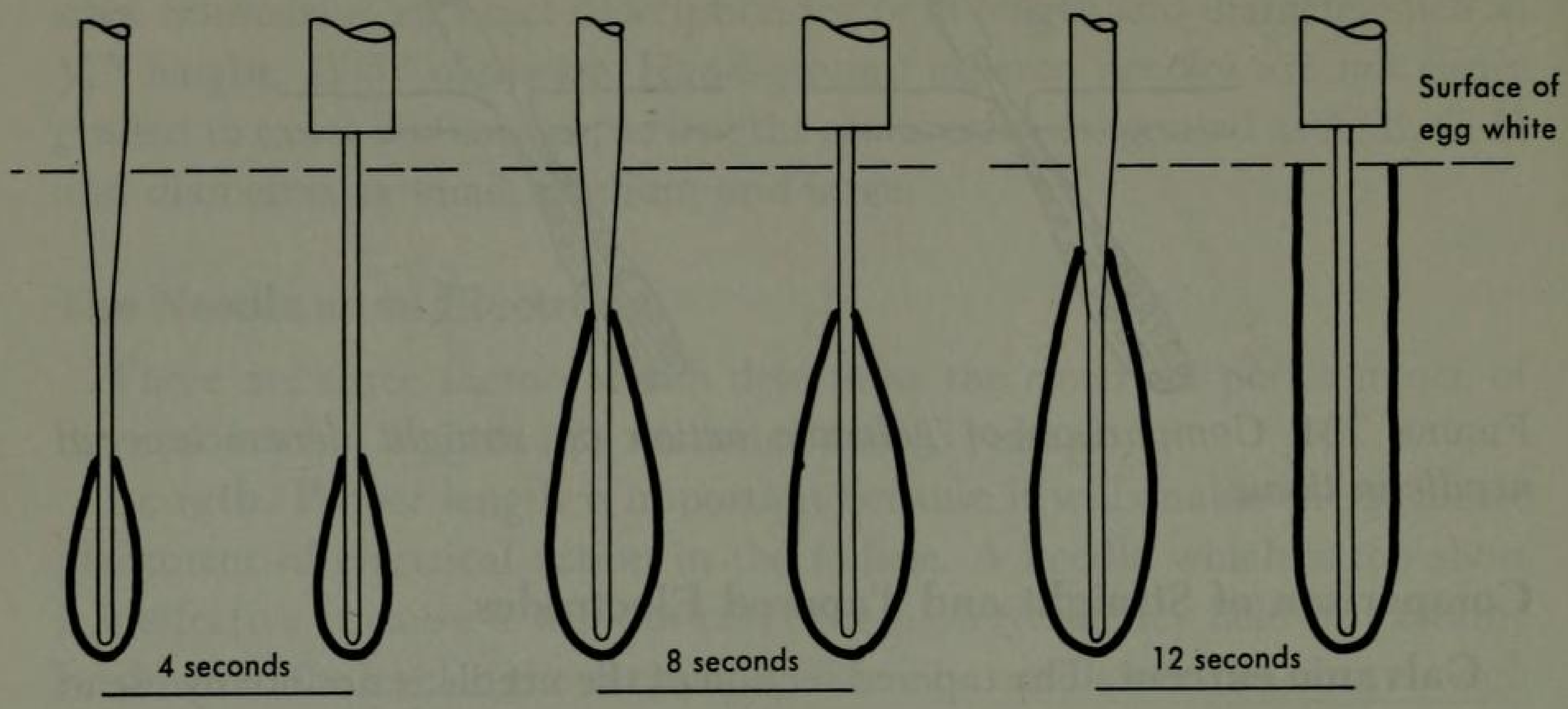

FIGURE 135. *Comparison of high-frequency pattern rise on straight versus tapered needle.*

Proper Use of the Tapered Needle

The tapered needle is not needed for many kinds of hair, since only those kinds which require intensive electrical action pose an epidermal overtreatment problem. But deep terminal hair are a common problem facing the electrologist. You should be well supplied with tapered needles of assorted lengths and diameters for use on these problem hairs, since the needle must almost be a "custom fit" for each type of hair you treat.

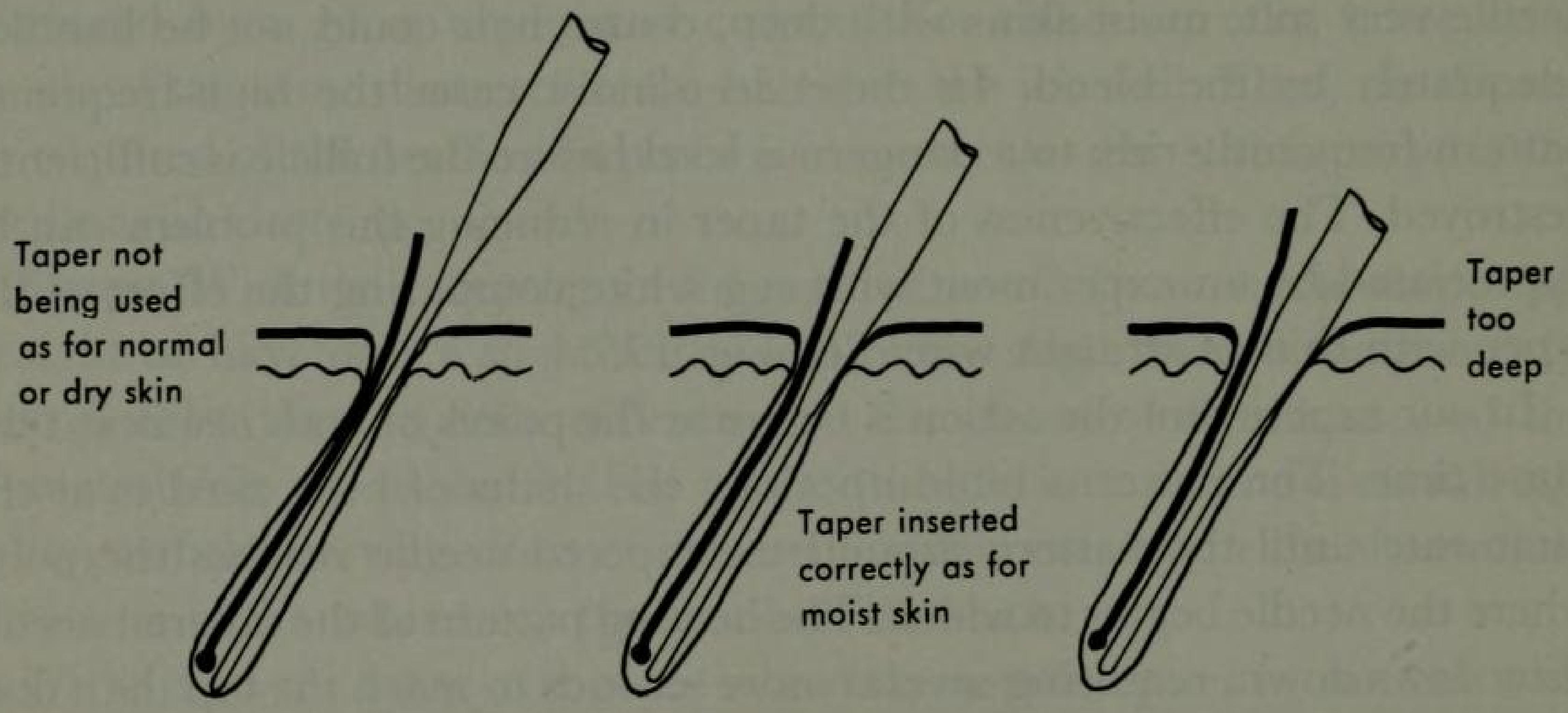
Taper not being used as for normal or dry skin
Taper inserted correctly as for moist skin
Taper too deep

FIGURE 136. *Proper depth of taper insertion.*

When working on deep, moist follicles, select the shaft diameter of the tapered needle in the same manner that you would an ordinary needle, but be sure that the *taper fits about halfway* into the pore of an average-depth hair in anagen. The tip must be at the depth of a papilla in anagen when the taper is properly inserted. See Fig. 137.

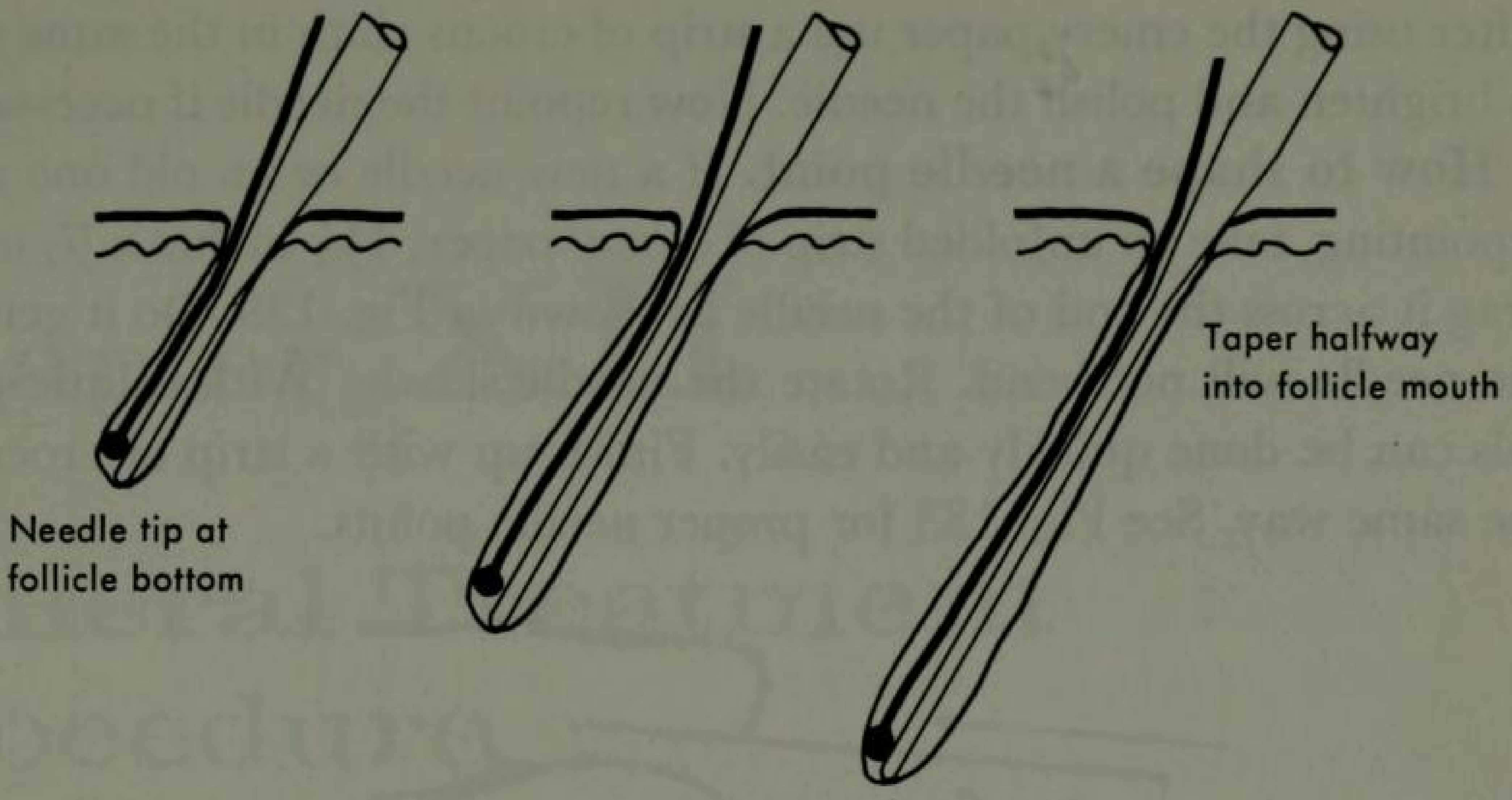
Needle tip at follicle bottom
Taper halfway into follicle mouth

FIGURE 137. *Fitting the tapered needle to the follicle.*

Hints for Increasing Needle Life

To care for your needles properly you should avail yourself of several grits (000 to 0000) of fine *emery paper,* some *crocus cloth* and a *soft metal tweezer* with a broad jaw. (Carbon or stainless steel tweezers should not be used.) Emery paper is used to change the needle's shape by wearing the metal away. The crocus cloth is used for polishing. Both emery paper and crocus cloth are available at any large hardware store.

How to decrease needle diameter. Cut your emery paper and crocus cloth into little strips 1½ inches long by ½ inch wide and fold them as shown in Fig. 138.

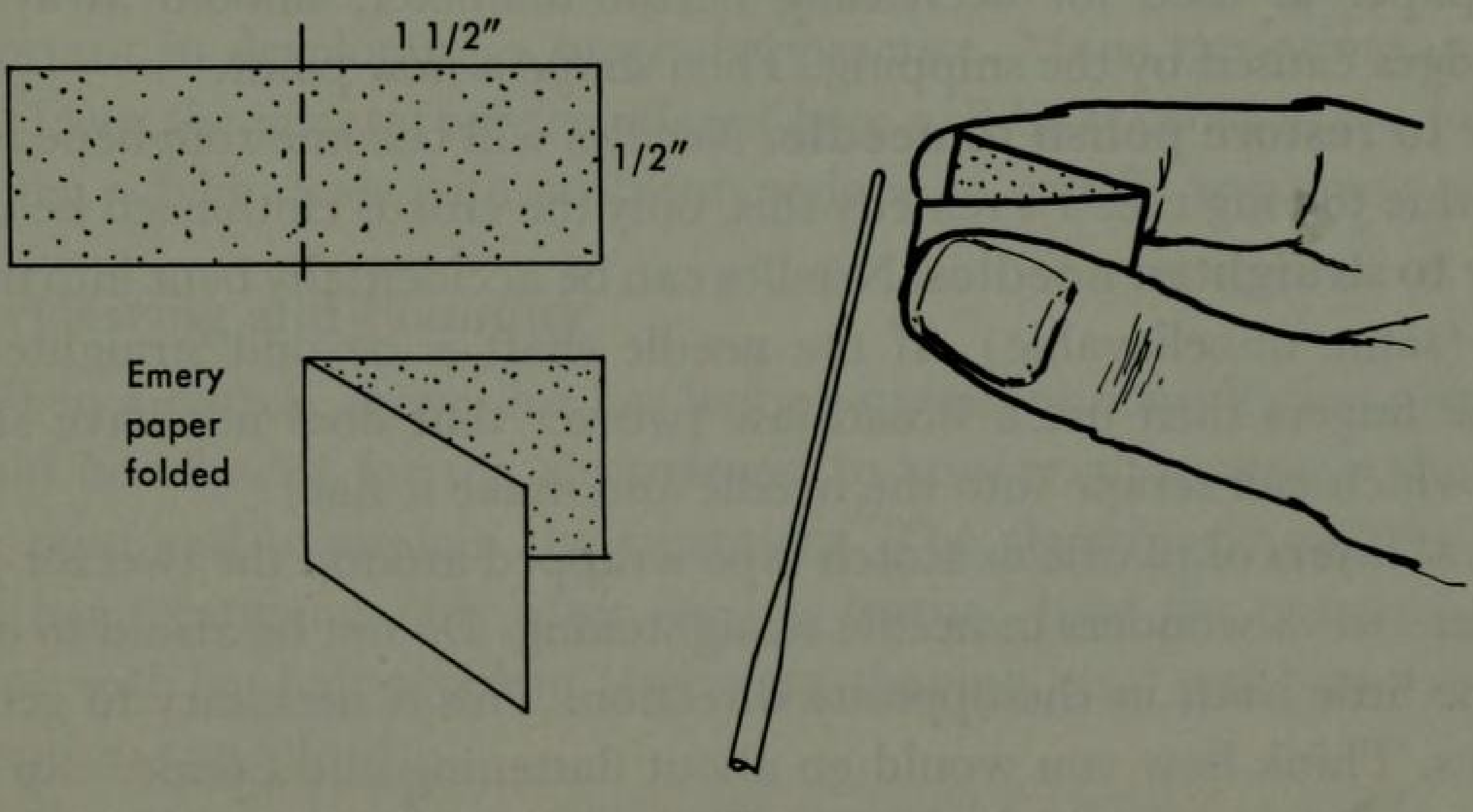

FIGURE 138. *Reducing needle diameter with emery paper.*

Pinch the emery paper against the needle as you draw the needle away from it, rotate the needle slightly and repeat. Continue until you have the diameter reduced sufficiently. Different grits of emery paper give different cutting speeds. A "3 ought" (000) is faster cutting than "4 ought" (0000).

After using the emery paper use a strip of crocus cloth in the same manner to brighten and polish the needle. Now repoint the needle if necessary.

How to shape a needle point. If a new needle or an old one requires repointing, take an unfolded strip of emery paper, 1½ inches x ½ inch and drag it across the end of the needle as shown in Fig. 139. Do it gently and the needle will not bend. Rotate the needle slowly. With a little practice this can be done quickly and easily. Finish up with a strip of crocus cloth the same way. See Fig. 133 for proper needle points.

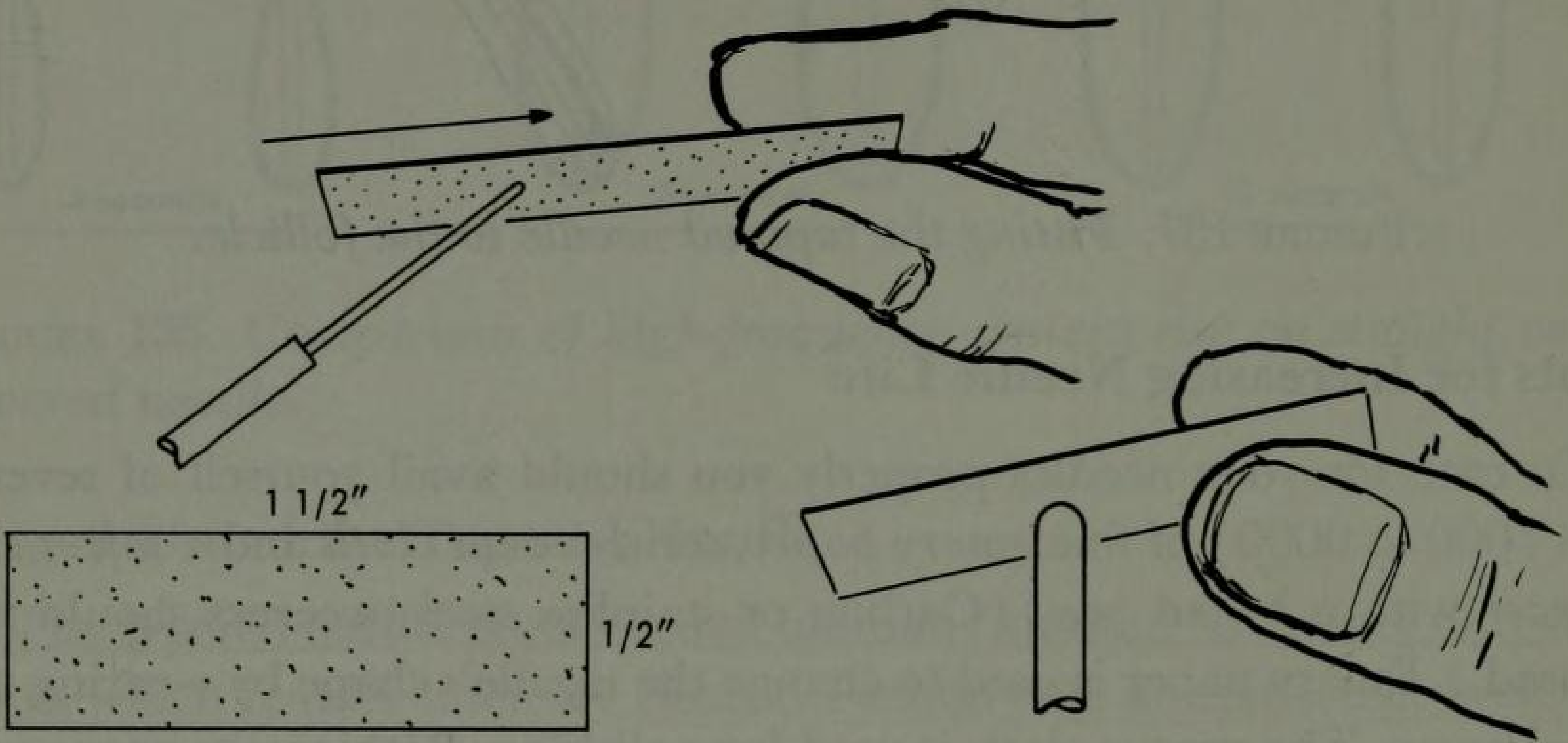

FIGURE 139. *Shaping a needle point.*

How to shorten a needle shaft. Take an old pair of scissors and snip the needle off to a size just a little longer than you want. Then, using the emery paper as used for decreasing needle diameter, smooth away any sharp edges caused by the snipping. Then shape a new point.

How to restore polish to needle. Needles will become roughened and eroded due to long use. To remedy this, only the crocus cloth need be used.

How to straighten needles. Needles can be accidentally bent into many shapes (some unbelievable). If the needle shaft is beyond straightening with the fingers then use a broad-jaw tweezer that does not have sharp edges (which can scrape into the needle and make it flat).

Several layers of plastic or scotch tape wrapped around the tweezer jaws sometimes work wonders in needle straightening. Do not be afraid to overbend the little shaft in the opposite direction. This is necessary to get out the kinks. Think how you would go about flattening out a paper clip or a hair pin and then apply the same thinking to the needle.

Needle reconditioning sessions are a great pastime while waiting for the telephone to ring or when your afternoon patrons have all cancelled out, not to mention all the money you will save.

Chapter XII

General Treatment Procedure

From the moment the patron first walks into your office until the moment she leaves, there are professional standards that must be diligently observed by you to make the treatment safe, effective and comfortable. To assist you in developing those habits and technics that will enable you to conduct your treatments professionally, this chapter explains, step by step, the practical problems with which you must deal before, during and after the actual use of the electrical needle. Interviewing, positioning, draping, lighting, sanitizing, anesthetizing, and post treatment medication must all be considered. Although none of these problems could be exhaustively examined in a single chapter, we shall give attention to those factors which are most important in developing a successful practice. Many deviations or exceptions from the general advice offered here will be covered in the following chapter, which deals with problems unique to specific treatment areas.

Interviewing and Planning

When a patron arrives for her first treatment or consultation, extra time should be allowed for the electrologist to answer all questions the patron may raise and to explain the treatment. The electrologist will be able to plan her treatments only after she has learned how the patron has been coping with her hair problem (tweezing, shaving, etc.) and how much time the patron can afford.

If the patron has been shaving she must be advised to let an area go unshaven so that the hairs will be long enough for the electrologist to grip with the tweezers. The patron need not stop shaving the other areas of her face or body. If the patron has been tweezing or waxing, the electrologist should try to work out a schedule whereby the treatments are timed with the arrival of previously tweezed hair. (For regrowth schedule see page 63.)

The desires of the patron must also be considered. Some patrons are only concerned with the removal of obvious dark hair and do not want you to bother with the lighter hair. Other patrons want almost "invisible" hair removed. To avoid embarrassing misunderstandings the electrologist should make sure she knows exactly what the patron wants accomplished before touching a hair. Normally the patron will want the most noticeable hair removed first. Less obvious hairs or hairs in other regions can be treated at a later date at the patron's discretion.

A case history card or record should be made out to include the patron's name, address and other pertinent information. Electrologists differ widely in their views concerning the amount of data these case histories should contain. Some believe diabetes, heart conditions, epilepsy, shock treatments and the like should all be known to the electrologist, while others feel that only a minimum of information is really needed. Some operators list all blemishes or scars in the treatment area and have the patron sign the case history card in order to release the electrologist from blame. Patrons often object, however, to all this "red tape." As in most cases, perhaps the middle of the road is the most feasible. Questions involving subjects or conditions that would be of little consequence to the administration of the treatment ought not to be asked. Chapter XIV will discuss case history cards in greater detail.

Evaluating the Appearance of the Skin Before the Treatment

What do we look for prior to giving a treatment? In Chapter III we discussed five factors of the skin which are important from the electrologists' viewpoint. These factors as well as several others must be considered when preparing to treat a patron for the first time. Moisture, oiliness, texture, thickness and expected sensitivity must all be evaluated in relation to the type of hair to be removed. But before this is done one must determine the health of the patron's skin.

If the skin is normal, healthy and free of secondary lesions then the electrologist can proceed as usual. If, however, the patron has a problem skin, the operator must evaluate the condition in order to determine where to treat or, in some cases, whether to treat at all.

In our chapter on dermatology, primary and secondary lesions and certain skin conditions were discussed in detail. At this point let us consider how the most common of these affect our treatment procedure. Some lesions will be unimportant while others will be crucial. We will examine the least important first.

(1) **Blackheads** (comedomes) and clogged pores mean little to the electrologist so far as treatment is concerned. They do reflect inadequate skin care by the patron in most cases. More thorough cleansing or a more efficient cleansing medium should be suggested. Ointments and oils for post-treatment or home care should be avoided since the skin is already excessively oily. Alcohol and astringent lotions are better than quats for this type of skin.

(2) **Healed scars from old injuries, plastic surgery, deep and superficial pits from previous acne** and other past skin diseases and eruptions do not represent a treatment problem. Evidence of these scars means nothing to the electrologist as long as they show no inflamation or activity. It is common to see hair growing around the edges and close by these scars. It is in the vicinity of these scars that the only truly distorted follicles are found. The direction and angle of insertion is completely unpredictable in follicles bordering the scar. The point to remember is that if you must insert through scar tissue, space your work. Scar tissue does not heal as readily as normal epidermis.

(2) **Variation in pigmentation** such as blotches (chloasma) and freckles (lentigo) create a beauty problem. While the causes of these conditions are varied, their appearance on or in the area of treatment should alert the electrologist to the possibility that more of them may appear of their own accord while treatments are in progress.

Pregnant women sometimes develop a collection of pigmented patches across the forehead and on the face which is called a "mask of pregnancy." This condition, as pointed out in Chapter VI, is subject to freckling from the application of currents. When treating patrons having pigmentation problems, scatter your work for a few short treatments and see how the skin is affected. In particular, do not push the skin to the stage of forming eschars on the hairline.

(4) **Scaling and flaking of the epidermis** and other conditions of this type may be the result of psoriasis if silvery scales are present. A dandruff-like appearance of the skin could be indicative of any of a number of other skin disorders. Simply ask the patron what her doctor's diagnosis is of her condition. How long has she had it and does it change into any other form like wheals or vesicles? If she has had it a long time and it is not infectious, you can safely proceed with the treatment. If you are in any doubt, contact the patron's doctor before beginning treatment.

(5) ***Acne*** conditions run the gamut from papules and pustules to cysts. It is a *chronic* inflammatory disease of the sebaceous glands and hair follicles. A single, simple pimple or ingrown hair should not be referred to as acne. In fact, even if you see an extensive condition, it is best not to refer

to it as acne in conversation with the patron. Keep all such appraisals to yourself.

Since the systemic factors which produce excessive hair often also cause acne, a large percentage of your patrons will have acne problems. To determine the proper approach to an acne condition, we must make an evaluation of the skin's appearance as well as the patron as a person.

In evaluating the skin two factors must be considered: (1) can the blood supply perform any more rehealing in the area, and (2) will pathogenic bacteria spread from the infected lesions into the treated and therefore receptive follicles? The size of the area involved, the stage of activity and the closeness of active pustules to the hair to be treated must all be taken into consideration. These two factors will be further influenced by the patron's intelligence; will she follow your home care instructions? (If she is already under the care of a dermatologist she should use the home care medication and instructions of her doctor.)

Often times where or whether to give a treatment is a difficult decision to make. Talk it over with the patron and let her know of your concern; a discussion will help you decide.

It seems appropriate at this point to bring attention to the difficult position in which some state board examination questions put the electrologist. A common question is whether it is permissible for an electrologist to work in an inflamed or infected area. A one word answer must be "no." How then could you ever handle the young adult whose minor acne problem may be prolonged over a period of several years? It *is* possible for treatments to be given, as long as the electrologist intelligently evaluates the case and treats accordingly.

(6) **Ingrown hairs,** infected and non-infected, pose a difficult treatment problem. On many patrons, especially those with curly or kinky hair, ingrown hairs are commonplace. To treat follicles that are not infected, use a pair of sharp-pointed tweezers as a probe to pull out and release the trapped end of the hair. If you can locate the follicle opening, treat it as usual. If you cannot find the opening, merely free the trapped end of the hair. *Do not tweeze it out.*

If the ingrown hair is infected, break the pustule open with your sterile tweezers and try to bring out the ingrowing end of the hair. Insert the needle alongside the root and apply the usual amount of current. If the hair does not release, reinsert on the other side of the root and repeat. If it still does not release, your currents will have at least killed some pathogenic bacteria. In a few days the epidermis will have rehealed around the freed hair and you can try again. *Tweezing only makes the condition worse,* because the rehealing epidermis will bridge across the pore, thus closing off the follicle. Another ingrown hair or possibly a sebaceous cyst would result.

Here again we are purposely treating an infected area, which, while seemingly contrary to some state board opinions concerning infection in general, is necessary if we are to eliminate the cause of infection, the hair itself. Often medical doctors refer persons with chronic ingrown hair problems to the electrologist. These cases pose no special problem to those who are properly trained.

(7) **Cold sores** (Herpes Facialis) and **fever blisters** (Herpes Simplex) contain pathogenic bacteria and should therefore be avoided in treatment. Because of the spontaneity of their appearance, electrologists sometimes mistake them for lesions produced by an earlier treatment. If you see suspicious scars in the corners of the mouth, ask your new patron if she is subject to cold sores or fever blisters. Making a note of this on the patron's record card may prevent later confusion when the sores erupt.

(8) **Dermatitis** or **eczema,** which vary in degree from a reddened and inflamed state to being incrusted, oozing and pus-filled, are cause for alarm. (See the chapter on dermatology for definitions and descriptions of dermatitis and eczema.) A condition of this type requires that the patron *not* be treated. Poison oak or other poisonous plants as well as hair dye, and allergic reaction to objects and substances are among the hundreds of possible causes of dermatitis or eczema. So far as the electrologist is concerned, none of these conditions can be accurately identified. Consult the patron's doctor if she insists that the work be done.

(9) **Moles** (Macules), and senile or actinic keratosis can be dangerous. These have been discussed at length in Chapter VI. If any growth is red or inflamed, stay a few inches away from it on the first treatment. Discuss it with the patron or her doctor before removing hair from a mole. Both state laws and malpractice insurance are concerned with the treatment and removal of such growths. Find out what your state and insurance policy specifies.

Positioning

The positioning of the patron must take into consideration not only the patron's comfort but the electrologist's comfort as well. The patron may sometimes have to be turned or manipulated to allow the electrologist to function efficiently, but with the proper attention to props a comfortable position for both can usually be achieved. The average electrologist makes more accurate insertions when the direction of insertion is within a range of straight forward to 90° (right angles) left. As she turns her needle from 90° left to straight backwards both her accuracy and speed decrease. The positions illustrated in Chapter XIII all take this factor into account. Any positions you devise yourself should thus allow for maximum comfort and efficiency.

Whenever you position a patron, it is important that you take into consideration her sense of equilibrium. Older people are especially prone to lose their balance, but patrons of any age may be found to have this difficulty. If, for instance, a patron expresses apprehension about having her head placed flat on the table it is best to go about getting it there gradually. First place the patron's head on a pillow and cover her eyes. After a few minutes of preparing for treatment, you can ease the pillow toward her shoulders in order to get her head in the desired position. By then she will have adjusted to the horizontal position.

The greatest difficulty with balance problems occur when the patron is preparing to leave the table after a treatment. Anyone who has equilibrium problems cannot be brought from a lying to a sitting position abruptly. First simply remove the covering over the patron's eyes. After she has become accustomed to the light help her slowly to a sitting position. If she wears glasses, help her put them on; some people need their vision for balance. Do not leave her side until you are confident that she has regained her balance. Then help her from the table. If for no other reason, you should carry public liability insurance to protect yourself in the event that the patron becomes dizzy after treatment and wants to hold you liable for a resulting accident.

Draping

The placing of towels or sheets on a patron is called "draping the patron" and is simply referred to as "draping." Draping, in our field, is basically for the protection of both patron and operator. It also serves a psychological purpose. Thus draping may be said to serve three principal purposes:

1. **To protect the operator.** Towels should be so placed upon the skin or clothing of the patron, that the hands and arms of the electrologist come in direct contact with only the towels. A skin-to-skin contact between patron and electrologist for extended periods is conducive to transmitting disease and therefore must be avoided.
2. **To protect the patron.** Besides guarding the patron against transmission of disease, properly placed towels protect the patron's clothing from spillage of lotions, salves and after-treatment medicaments. The draping also keeps street clothes and hair away from the area being treated.
3. **To create a feeling of security.** Draping causes the patron to feel more secure by catering to her required modesty and dignity. This is especially important for the male electrologist to remember. Booths in schools

and other locations where complete privacy is not possible necessitates greater attention to draping than usual. A towel placed across the hemline may mean the difference between a relaxed one hour treatment and a squeamish fifteen minute session. It pays to drape a patron properly.

Proper Lighting

Most light sources used by the electrologist fall into one of two categories. Either the light is part of the viewing magnifier lens or is separate from the viewing lens. Side lighting by daylight or an auxiliary artificial light source is an invaluable aid in seeing the fine lanugo or colorless hair. Where separate light sources are used the magnifying lens must necessarily be otherwise supported if not worn on the electrologist's head.

Sanitizing the Area

Simply moisten a wad of cotton with a germicide (one approved in your state) and wipe clean the area to be treated. When the cotton no longer shows signs of soiling you may assume that all residual foreign material has been removed. (Chapter V contains full details on sanitizing.)

Placing the Inactive Electrode

If galvanic current is being used either alone or with the blend, the inactive, positive electrode should be placed in contact with the patron's skin. A hand-held wet sponge electrode or a cup or jar containing water into which the patron's hand is placed, are the most common devices in use.

Sometimes if the patron's hand is chapped or fissured from weather or strong solutions of detergents or is raw from other causes, the positive galvanic current produces an intense itching due to the hydrochloric acid generated in the broken raw skin. If this occurs, place the sponge electrode on the forearm, under the back of the neck, or under the thigh.

A piece of plastic sheeting 18 inches square is useful to keep patron's clothing, pillows or table top away from the wet sponge. Be sure patron's hand is free of oils, creams and hand lotions so that good electrical contact will be made. Sponges should be moistened with a strong salt solution of at least a heaping tablespoonful to a pint of warm water. Ice cream salt or water softener salt is better and cheaper than table salt.

Do not wash sponges in oil-rich facial soaps because the oils they contain reduce electrical conductivity. Put sponges in a mild chlorine bleach solution for a few minutes when soiled. Remove as soon as soil disappears so sponges do not disintegrate. Damp paper toweling or a small wash cloth can be wrapped around the metal electrode in lieu of the sponges.

Desensitizers

According to Webster's Dictionary, to "desensitize" means "to make emotionally insensitive." It is your authors' opinion that this terminology expresses most accurately that which we as electrologists are permitted to do with regard to pain. Only the medical profession can legally use effective anesthesia. The few anesthetic drugs available to the public or the electrologist without a prescription are too low in percentage to be more than partially helpful. Applied with the proper "bedside manner" and accompanied by "vocal anesthesia," however, they can be psychologically quite effective.

Aspirin and other pain-killing drugs are very useful but should not be administered by the electrologist. *Never give the patron any pill, not even aspirin.* Advise sensitive patrons to purchase aspirins or other drugs on their own or with a doctor's prescription, if necessary. To dispense drugs is "practicing medicine without a license."

The electrologist should not overestimate the pain-killing powers of desensitizers. To be sure, many of them will actually raise the patron's threshold of pain. But, it must be remembered that the settings on your electrology equipment can easily be made to exceed the threshold point. Only a patron under a general anesthetic or a cadaver would be completely insensitive.

All desensitizers must be thought of as something to merely enable the operator to go faster or to enable the patron to tolerate the treatment longer. When and how to use desensitizers will often have to be decided on the basis of what you judge to be the patron's sensitivity. Remember, for example, that a woman will be more sensitive to pain just *prior* to menstruation.

Desensitizers fall into several categories which we will discuss briefly:

1) Lotions, liniments, analgesics.

Lotions and liniments containing alcohol, chloroform, camphor, menthol, oil of wintergreen and the like produce either a cooling or a stinging effect on the patron's skin which mentally distracts the attention of the patron from the intense sensation of treatment. Analgesics in ointment form accomplish the same effect, but are less convenient to use.

These same substances with benzocaine or any other caine, while very effective on mucous membranes such as inside the mouth or other body cavities, are relatively ineffective when applied to the epidermis, except of course, for their psychological effect.

2) Cooling gases and volatile liquids.

Certain gases such as freon can be put under pressure and reduced to a liquid state. These gases when released through a small opening or jet are emitted at a very low temperature which causes the skin upon which they blow to get very cold. The numbness which is caused will be effective for a few minutes, but then has to be repeated.

Ethyl chloride is a volatile liquid that produces a superficial freezing effect by its rapid vaporization from the skin. Its cooling effect lasts but a minute or two. It is available on prescription only and if your patron brings it in, caution her to be careful not to inhale it. It is highly flammable.

3) **Air cooling devices.**

Air-equipped needle holders that cause a stream of air to be blown on the skin have effective psychological value because of the cooling effect they produce. Areas like the lip, face and underarm, because they have a large amount of surface moisture, evaporate readily and therefore feel quite cooled by the blowing air. Legs and other dry skin areas do not respond significantly to the cooling effect.

Air cooling devices effectively deter overtreatment on some areas by reducing high-frequency heat at the surface—a most valuable feature for delicate face work.

Vocal Anesthesia

A patron can be helped to relax by what we have called vocal anesthesia. It consists of talking to the patron in a manner that "implants" pleasant and comfortable thoughts about the work being performed. All words such as "pain," "needle," "sharp," "electricity," "burning," "piercing," "sticking," "scarring," and others that have an objectionable connotation should be stricken from the electrologist's vocabulary. Talk instead of "discomfort," "round-tipped wire" or "probe," "action," "heat" and "insertion."

A patron cannot relax when she is spoken to in this manner: "Now all I am going to do is stick a needle alongside this hair and turn on the electricity and burn out the root. Ooh!! Did that hurt too much? Guess I will have to turn down the electricity."

The patron's nervous system would be less affected it she were spoken to in this way: "Each hair grows out of a little opening called a follicle. I will gently slide a tiny rounded probe alongside the hair. You will not feel it at all. Now the action of the machine will make it feel warm. This heat releases the hair from the follicle. There, the hair slid out. Was that uncomfortable?" If you advise the patron that she controls the speed of the treatment by letting you know the amount of heat she can comfortably tolerate, she is quick to realize she will get more for her money if she can take more heat. Also advise her that she can always tell you to slow down a little if the treatment becomes too uncomfortable. *Placed in the "driver's seat," so to speak, the patron's degree of tolerance is increased many times.*

Avoiding Poor Work Habits

When it actually comes to inserting needles into follicles and applying the currents, there is very little positive advice that can be added here. Chapters VIII, IX and X have provided enough information on the fundamentals of technic to get you started, and the rest is a matter of practice and familiarity. We can, however, offer negative advice about certain undesirable habits which develop easily during the time you are learning to use your equipment. The following list enumerates seven of the most common work habits which lead either to inefficiency or to ineffectiveness in treatment. Consider these as *don'ts:*

1. **Stroking or brushing the patron's skin between each insertion.** This may feel pleasant to the patron but is mighty expensive. Wiping the area occasionally with a cotton swab saturated with disinfectant has merit but do not get into the habit of doing it after every epilation.

2. **Stopping after each epilation.** The electrologist should move from one follicle to the next with little or no hesitation. If you find yourself pausing between insertions, perhaps you are uncomfortably seated or your patron is awkwardly positioned. This would tend to make you stop and "rest" after each epilation. Footswitches that are hard to depress may also be to blame. Train yourself to look around for the next follicle to insert into while waiting for the present hair to release. Avoid the habit of toying with several hairs with your tweezers before deciding on one to treat.

3. **Unnecessary stretching or pulling of the skin.** Although putting tension on the skin with the free hand is necessary to facilitate insertion in many cases, it is not necessary with all cases. Body work seldom requires holding the skin because it is usually quite firm, even though face work, especially on older women, demands much holding. Because it takes up valuable time, try not to carry skin-stretching habits from cases which require it to cases which do not; use only where necessary.

4. **Holding the hair with tweezers before inserting.** Electrologists who hold the needle and tweezers in the same hand do not develop this habit, but those who use both hands are very prone to lift on the hair to see where it enters the epidermis and then insert while still holding the hair. The insertion is seldom an accurate one because the random angle at which the hair is held does not permit the electrologist to see the true angle of insertion.

5. **Wiggling the needle.** Manual technics allow the electrologist time to engage in little rituals like making circular or up and down motions with

the needle while the current is on. This should be avoided—it annoys the patron and does not increase efficiency. If the needle is backed out too far you may overtreat the surface.

× 6. **Pressing a dimple in the skin.** When the needle has been fully inserted relax your pressure so that the skin is not pushed into a depression. Back up slightly so that the epidermis is level. This will prevent the follicle from moving up around the needle once the currents are applied.

7. **Treating at too shallow an angle.** Inserting at a near-horizontal angle to the skin sometimes causes the side of the needle to touch the surface of the skin. See Fig. 140. Leaving the needle at this angle would cause the epidermis to absorb some of the action of the high-frequency field around the needle, thus reducing the action in the follicle. To avoid this problem raise the needle from the surface slightly once you have inserted.

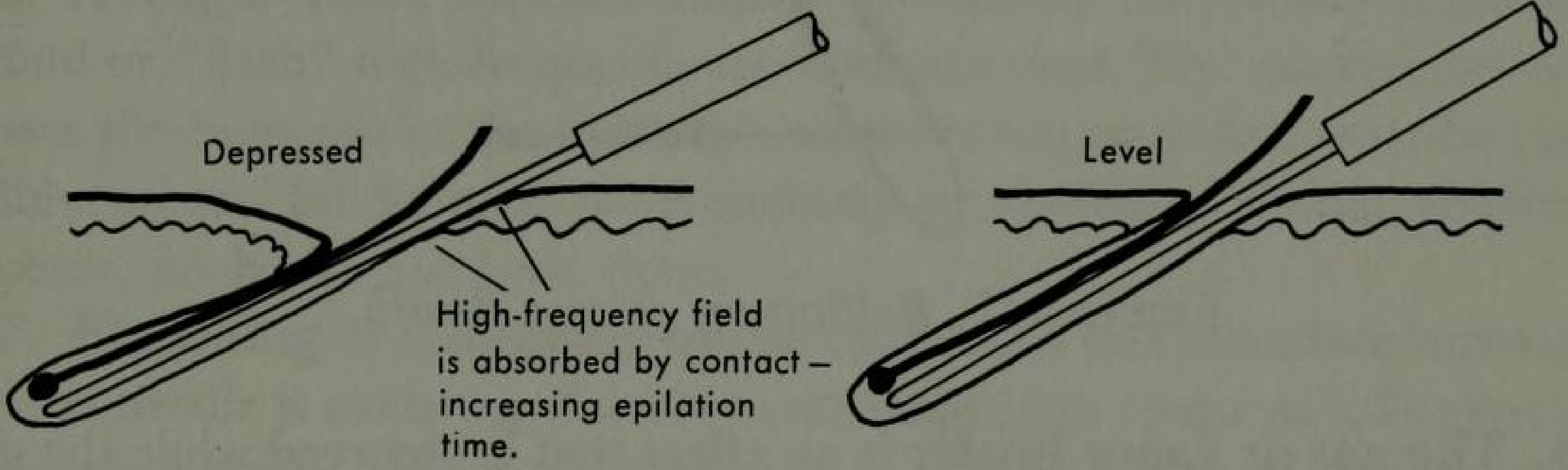

Figure 140. *Proper insertion for near horizontal follicles.*

Evaluating the Appearance of the Skin During the Treatment

In the process of inserting the needle, applying the current and epilating the hair, several effects occur at the surface of the skin during the course of the treatment. These effects should be defined and explained. Eight of the visible effects are listed below in order of importance.

1. **Loss of skin pinkness as the needle is inserted** is due to the pressure of the needle against the capillaries surrounding the follicle. This forces the blood out of the immediate area. The effect is unimportant.

✓ 2. **Loss of skin pinkness as galvanic current is acting** upon the follicle is caused by froth which has gotten under the upper epidermal stratum instead of coming out at the surface. This commonly occurs on a tight dry epidermis such as on the lower leg. A smaller diameter needle could prevent this, by allowing the froth to escape. But this effect is unimportant on body areas, and seldom occurs on the face.

3. **A balling-up of tissue** is an effect that is often observed as the hair ✓ is epilated from the follicle. Usually the hair epilates easily but exhibits no tissue sheath on the root, the tissues having been skinned off by the stratum corneum or lucidum. The resulting ball of tissue should be lifted from the

skin on facial areas, especially the upper lip, because this dead tissue readily incubates pathogenic bacteria. This could form an unsightly pustule.

On body areas this balling-up of root-sheath tissue should be ignored since it is in a less prominent area. Resulting pustules will soon disappear, and speed, not temporary appearance, is the primary objective in body work. Removing the needle before epilating the hair, using a smaller diameter needle, or keeping the needle taper out of the follicle will prevent this balling-up from occurring, if it is bothersome.

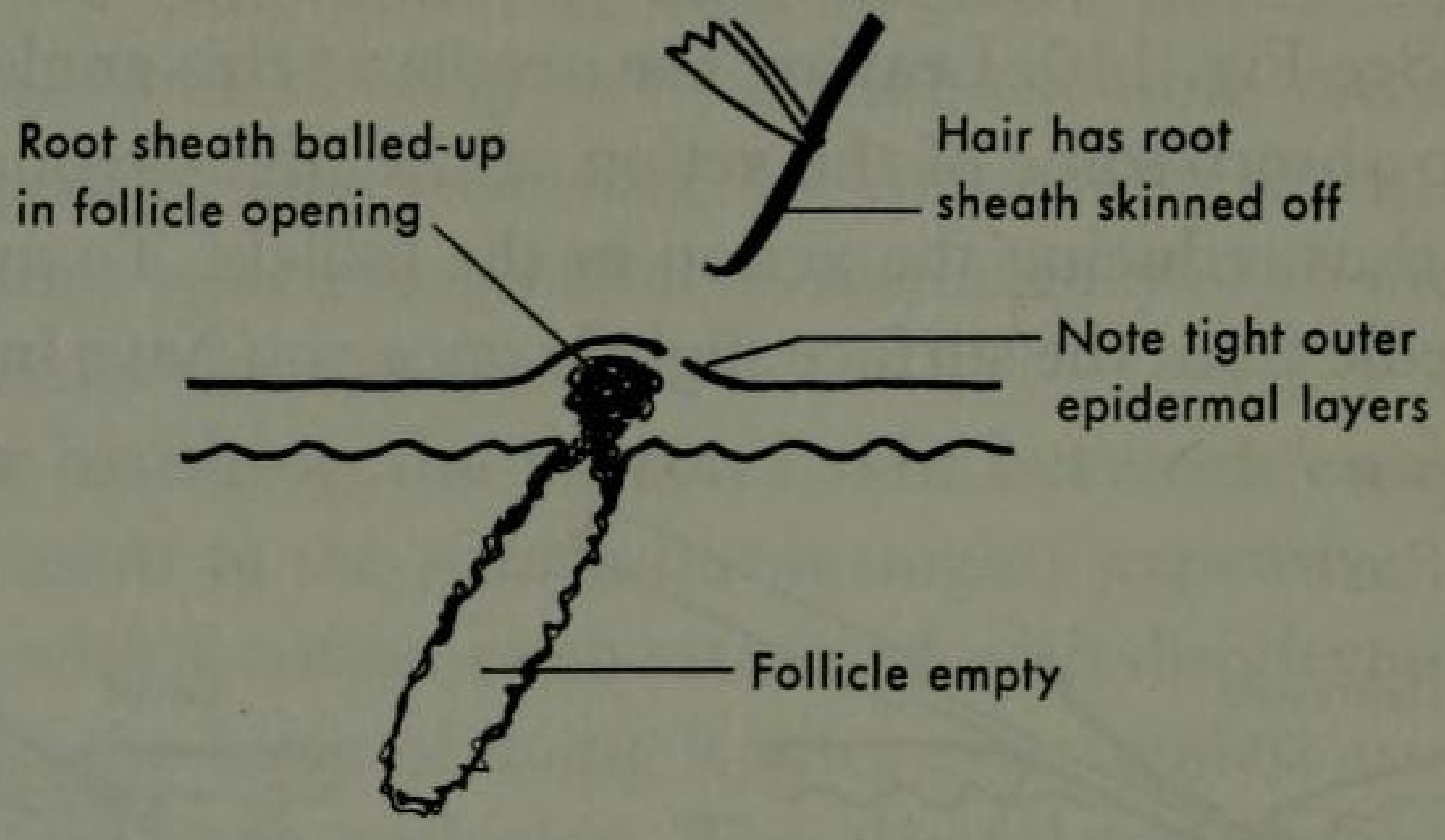
Root sheath balled-up in follicle opening
Hair has root sheath skinned off
Note tight outer epidermal layers
Follicle empty

FIGURE 141. *Balling-up of root sheath.*

4. **The gas or vapor blister** is an effect that is observed while the galvanic current is on and the needle is in place. A gas blister quickly forms within one or two seconds, and usually crops up on only one side of the needle. This blister is inflated with hydrogen gas if only galvanic current is being used or with hydrogen gas and water vapor if the blend is being used.

The blister is the result of two factors, a rapid manufacturing of gas and a "corking up" of the follicle by the needle. The pressure builds up in the follicle but cannot get past the uppermost layers. Hence a gas blister is formed. When the needle is removed, the blister can be flattened by pressing on it. No liquid is exuded from a gas blister.

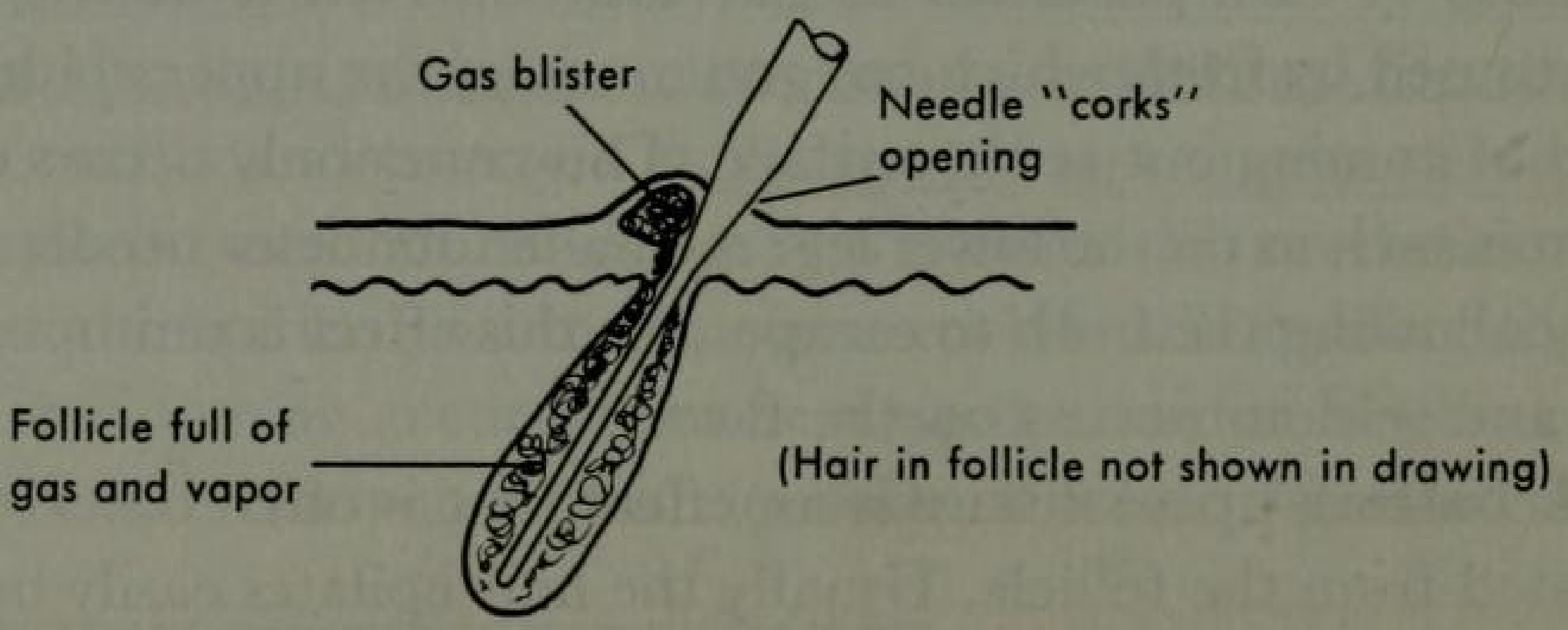
Gas blister
Needle "corks" opening
Follicle full of gas and vapor
(Hair in follicle not shown in drawing)

FIGURE 142. *Formation of a gas or vapor blister.*

Although the gas blister is no real problem on the body, it is undesirable on the face. The blister could harbor pathogenic bacteria and thereby become a pustule.

To prevent gas blisters from forming, you can either reduce galvanic current slightly or reduce the needle or taper diameter to avoid "corking up" the follicle. Milliampere settings in excess of 1¼ mas. (12/10ths) are usually being used when gas blisters occur. (Single needle.)

5. A black or blue mark or lump that appears when the needle is inserted is a mechanically-caused bruise resulting from improper insertion or from an oversize needle.

Apply cold compresses, ice cubes or pressure immediately if desired. After 24 hours apply heat and cold as for swelling. (See later section on special home care instructions.)

6. **A vapor blast** appears around the needle only when fractional-second or "flash" high-frequency methods are used. The extreme intensity causes the moisture in the tissue to convert to vapor so fast that the tissue visibly moves. So long as no whitening or blanching of the epidermis appears, no harm has been done.

7. **Blanching or whitening of the epidermis** on the surface surrounding the needle is evidence of overtreatment by high-frequency. It must not be confused with loss of pinkness as we mentioned above. When high-frequency blanches the skin the whiteness appears right on the surface, is sometimes slightly elevated and does not fade away. The whitened tissue is cooked beyond recovery and will have to slough off. The epidermis will have to rebuild under a lymph or blood crust, taking two to four weeks depending on the patron's rate of healing. Red spots may persist for one to four weeks or longer, depending upon the extent of the overtreatment and whether or not infection has developed. Loss of pigmentation may occur on some skins if destruction has been extensive.

If crusts are picked or knocked off, depressions or pits will remain. These will require years to level out, if ever. Obviously, blanching must be avoided.

8. **Weeping follicles** may result when galvanic current causes excessive chemical decomposition. Open oozing follicles can also appear as a result of the surface action of high-frequency if the patron's skin is very oily and soft.

Post Treatment Considerations

Upon the completion of an electrology treatment, the area is again disinfected by the application of a germicidal solution. This is for the purpose of sanitizing the area prior to the application of ointments, lotions, salves or medicated cosmetics.

If much welting or redness occurs as the result of galvanic action, the area should be cataphoresed, using a disinfectant as the conductive solution. If the work has been scattered over a large area, cataphoresing would not be practical; however redness and welting in such cases usually does not persist for more than thirty minutes.

Post Treatment Medication

Any product sold over the counter and recommended for burns, including sunburn, is usually satisfactory for home care by the patron. But for office after-treatment a preparation with a cosmetic foundation is preferable. You do not, after all, want your patron to leave your office with an unattractive appearance. Medicated, non-allergenic cosmetics are readily available in prescription drug stores for teen-age and acne skin conditions. Some lines of cosmetics are especially designed for oily or dry skin and come in many shades.

Calamine lotion has been the old standby for many years, being both economical and effective for large body areas. Antiseptic powders are also useful, and like calamine lotion, can be purchased with or without phenol added. However, both have a drying effect that quickly tends to bring about any eschars that are going to form.

Ointments, oils (olive and baby) and salves tend to keep follicles open and prevent eschars and lymph crusts from forming. It has been our experience that on the *average* skin, keeping the area open for twenty-four hours by an invisibly thin layer of ointment or oil produces better results than the drying applications. After twenty-four hours, if no complications develop, the area may be left free of medication.

As a rule, extremely oily skins heal better when a drying type of medication is used while extremely dry skins respond better to an oily type of medication.

If pustules and slow healing are a continual problem for a particular patron, such as a diabetic, the use of an ointment containing an antibiotic will be of great value. Some skins react unfavorably to certain drugs, so ask your patron if she is sensitive to a drug before it is applied. Dermatologists say that *over-medication* is the cardinal error in skin treatment. It would be well for the electrologist to heed this advice and use sparingly only the simplest of medicaments, especially on the new patron.

Usual Home Care Instructions

For many years it has been common practice for the electrologist to tell the patron not to use soap and water on the treated area. Yet nurses and doctors regard soap and water as a must for washing flesh wounds. The electrologist's advice, at first glance, appears inconsistent with sound medical practice, but actually the doctor's purpose is quite different from the electrologist's; he is attempting to rid the wound and surrounding skin of all debris, soil, and dried blood prior to his disinfection of the wound and subsequent closing of it. Treated follicles, if cleansed after treatment, are already free of foreign materials.

The electrologist advises the patron to keep soap and water off the area to keep her from smearing contaminated make-up and street dust into the area of treatment. Electrical action and after-treatment medication have left the treated area sufficiently sanitized. Any cleansing within the first twenty-four hours should be done with solutions like 70% alcohol or 1000 ppm Q.A.C. to ensure that contaminating elements will be removed.

Generally speaking, it is wise to advise the patron to avoid any kind of activity that would subject the skin to abnormal conditions while it is in a rehealing stage. Getting sunburned, for instance, will turn a first degree burn from the needle into a second degree burn at the site of each follicle.

Home medication recommendations in the usual case will be the same as discussed above for application after the treatment. If you do not have a preparation to sell the patron for home use ask her what she uses at home for minor cuts and insect bites; it will usually suffice.

Special Home Care Instructions

A. INFECTION

Infection of a treated area is hardly ever the fault of the electrologist. There are many patrons with so much pathogenic bacteria present in their pores and follicles that it is difficult to prevent pustules from developing. Also, many patrons will not follow the electrologist's instructions for home care. Within minutes after leaving your office, a patron may apply powder with a soiled powder puff, then later blame you for the pustules that have formed, never admitting that she did not follow your instructions. This is not to say that only the "disobedient" patrons will become infected. Certain natural occurrences, such as perspiration, can spread contamination as well.

In any case, when infection presents itself (usually after 24 hours), the electrologist should recommend that hot epsom salts or boric acid compresses be applied every three or four hours during the first day. Two heaping tablespoons to a quart of water is adequate. The patron should apply compresses for about 15 minutes and then dry the area and apply 70% alcohol, followed by a thin layer of ointment or oil. This will usually open the pustules, which are superficial. The following day she should use a disinfectant only, if all evidence of pustules is gone. Otherwise she should continue with the initial treatment for another day.

If any crusts or scabs form, advise the patron not to pick them off, since small semi-permanent pits will result. These pits will have been caused by the patron's interference with the rehealing process of her skin.

B. SWELLING

The potential causes of swelling are many but the most common are over-insertion, allergies to galvanic current, too much work in too small an area, and dermagraphia, which is a reaction to the mere insertion of a foreign object into the follicle.

If swelling occurs in the area of the treatment, hot and cold compresses applied alternately will speed up the reduction of the swelling. No epsom salts are needed. An ice cube wrapped in a plastic bag or by itself is excellent as the cold application.

C. WATER BLISTERS—EXUDING LYMPH—BLOOD CRUSTS

Water blisters result from over-treatment of the epidermis with high-frequency current. They later form into minor lymph crusts if no infection develops.

Exuding lymph is merely a stage before the formation of major lymph crust which should not be picked off or disturbed in any way, since this would leave a shallow pit.

Blood crusts indicate severe over-treatment. If the patron applies ointment for several days and does not disturb the crust in any way, the skin should heal in a normal manner.

If infection accompanies any of the above three conditions then follow the instructions for infections.

Evaluating the Regrowth

The success or failure of any treatment is not apparent until the regrowth comes in. Of course, no treatment, no matter how successful, will be totally free of regrowth; it is the *percentage* of returning hair that will indicate the degree of your success. And your patron's opinion of your ability as an electrologist will rise or fall in accordance with the amount of hair that must again be treated.

In the long run, it is obviously more important to effect a high percentage of permanent destruction among a moderate number of follicles than it is to produce an unimpressive percentage among a large number of follicles. If you treat 1000 hairs and 800 return, your patron would be discouraged, whereas, if you treat 500 and only 50 come back, your patron will be very pleased. A pleased patron means more referrals and greater personal gratification for you.

Causes of Regrowth

The electrologist must be able to interpret the appearance of regrowth, if she is ever going to evaluate her technic. The first thing she must realize, however, is the fact that a certain percentage of the hairs appearing in a previously treated area have come from follicles which were not treated at all; there is always a proportion of hair that is not apparent at the time of treatment. Chapter III has provided sufficient information to allow you to estimate that proportion. What we shall concern ourselves with here are the causes of regrowth from follicles which have already undergone treatment.

The two basic causes for regrowth are (1) an inaccurate insertion, which puts the action of the current in the wrong place, and (2) an accurate insertion which puts insufficient action in the right place (papilla and hair germ cells). The regrowth from these two causes can be easily distinguished from one another. Regrowth from inaccurate insertions reappears on the same schedule that tweezed hair would. Regrowth for the second reason, that is, from insufficient action, will in most cases, require a much longer time to reappear because a whole new lower follicle and papilla must often be reconstructed from the surviving tissue.

Insufficiently treated follicles also differ from "missed" ones in their physical characteristics. When they emerge, "missed" hairs have a diameter and color similar to those of their predecessors, but hairs from insufficiently treated follicles are smaller in diameter, are a shade lighter in color and are often misconstrued as completely new virgin growths, which, of course, they are not. It is not unusual to see delayed regrowth in heavy body cases which are thought completely "cleared," but have been treated with insufficient current. A fine growth will appear at the end of two months or so, coarsening and becoming deeper at three to four months and eventually appearing at five months as though it had never been treated. The darkening and coarsening of these hairs in so short a period is what betrays them as regrowth rather than new growth.

COMPUTING THE REGROWTH RATE

Keep a record of the extensiveness of each area initially treated in the span of one hour. When you are sure that the real regrowth has come in, time yourself to see how long it takes to clear the same size area a second time. If you pick up all the regrowth in, let us say, fifteen minutes, then you will have killed better than 75% (because a small percentage would have come from follicles which had no hairs to treat during the original session, having been in the shedding phase of their cycle). The percentage of "kill" for any given treatment session, therefore, can always be calculated by computing the percentage of the original time that is required to clear the identical area during a second session, then adding to that the probable percentage of hair that had not been apparent during the first session.

SCHEDULING ACCORDING TO REGROWTH

Average Time of Hair Reappearance After Tweezing or Waxing.*

Deep, coarse, bulbous terminal hair (as on chins)	5 to 6 weeks
Medium depth terminal hair (as on side of face and body)	6 to 7 weeks
Medium depth intermediate or accelerated lanugo hair	7 to 9 weeks
Shallow lanugo hair (downy, general face)	8 to 10 weeks

The above schedule (which also appears in Chapter III) provides approximations for the length of time required for hair of varying depths to reappear after tweezing. Since a "missed" follicle is in reality a tweezed follicle, the schedule will apply to both tweezed hair and "missed" follicles. It is not possible to schedule the regrowth interval of partially-treated follicles because the time required for a new follicle to be regenerated in such an event is directly proportionate to the degree of destruction, which will vary in each case. The additional delay can range anywhere from three weeks to four months. If there is no regrowth of this type by the end of five months, you may presume that there will be no such regrowth.

There is no precise way in which the regrowth table offered above will enable you to schedule your patron's treatment appointments (there are too many variables involved, e.g. age and degree of hormonal imbalance), but the table is valuable as a rough guide for dealing with the return of hair in previously treated areas. If, for example, a patron has a minor problem which can be initially cleared in three or four half-hour or hour sessions, you should schedule succeeding appointments for the date on which you anticipate the regrowth. The time length for which you schedule these succeeding appointments should be shorter in proportion to the amount of regrowth expected (reducing hour sessions to half-hour or fifteen minute sessions, for example). This, of course, will vary according to the technic and the difficulty of the case.

In the event that a patron desires extensive treatment, requiring many weeks of appointments just to cover the entire affected area once, your knowledge of the regrowth cycle will not affect the way in which you arrange her appointment schedule so much as it will your plan of operation. It is important to know when regrowth will appear because you will want to treat it as it emerges from the follicle. As pointed out elsewhere in this book, a hair in the early stage of anagen is relatively shallow and straight and therefore easier to treat successfully. Your highest percentage of "kill" is accomplished by treating hairs in early anagen. Make sure that your patron continues on a steady schedule so that you can catch these early growths.

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*The authors are aware that this schedule indicates reappearance of tweezed hair in less time than medical investigators have recently stated. It is our opinion, however, that the schedule is closer to what electrologists will experience because in most cases their patrons will have excesses of androgenic hormones which accelerate the regrowth process.

IMPORTANT

Since regrowth does come in at a shallow depth, you must be sure to adjust your settings accordingly. When working on these hairs, be sure that the patron feels the current. A major mistake with respect to regrowth is to fail to use enough current because early anagen hairs epilate so easily.

In any case involving a fairly extensive amount of treatment, the overlapping of different phases of regrowth may cause unwarranted concern about the "excessive" regrowth. After about twelve weeks of treatment of the average coarse terminal hair on the face, it is not unusual for the second regrowth of the deep hairs to arrive coincidentally with the first regrowth of more shallow hairs. When this happens a greater than usual regrowth appears. This coincidence must be anticipated by both the electrologist and the patron. You may find it necessary to schedule additional treatment time to "clear up" the area, but be sure to explain to the patron that the addition to her normal schedule is only a temporary measure to eliminate coincidental phases of regrowth.

Whenever there is an unexpected increase in regrowth, it is wise to review and appraise those factors in your technic which would affect the thoroughness of your treatments—such things as timing, units of lye, depth of insertion and needle diameter. If all factors have been correct, if the hairs have been releasing properly, and if the patron has been feeling the current, continue as you have been—do not panic—there is no need to increase the settings. Continue as before and by the end of another few weeks there will most likely be a sudden drop off in returns. If, on the other hand, it appears that you have done something wrong, determine the type of hair which constitutes the majority of the regrowth. If most of your regrowth is of the deep type, it is possible that your insertions have been consistently too shallow or that you have been using insufficient current. If most of the regrowth is shallow, it may be due to overinsertion or to epilating too soon.

Communicating the Facts of Regrowth

An electrologist may be highly successful within her limits as an electrologist and still be a failure in the eyes of her patron, if she has neglected to prepare the patron in advance for the regrowth. Even a fifty percent regrowth rate can be a sign of success for certain very difficult cases, but the patron cannot appreciate this unless she is made to understand that regrowth is an unavoidable problem in electrology.

You should anticipate the first appearance of the regrowth by watching her patron record card. Tell the patron when to expect it. By predicting the appearance of the regrowth you will impress the patron with your knowledge of your work. If you merely let the regrowth surprise the patron you can impress her only with your alibis.

Chapter XIII

Treatment of Specific Areas

In the preceding chapter we discussed in a general way the many facets of giving a treatment. We still have before us, however, the task of elucidating the special problems and practices unique to each specific area of the body.

Every "geographical" location on the surface of the human body has certain histological characteristics which make it different from the others. Consequently the electrologist's method has to be modified to suit the unique conditions of the area she wishes to treat. Personal judgment plays an important part in dealing with specific problems, but there are certain "ground rules" to be followed. It is as a guide or aid to your own personal judgment that your authors offer this outline of practical considerations *typically* associated with specific areas of the body.

To deal adequately with each "geographical" area, a format employing the following sub-headings has been adopted: Positioning, Area Characteristics, Pre-treatment, Suggested Technic, Post Treatment and Special Home Care Instructions. As you can see, most of these categories have been discussed more generally in the preceding chapter. Practices suggested in the preceding chapter should be considered standard procedures, to be deviated from or added to only where specifically indicated in the following outline. Keep in mind, nevertheless, that even these deviations and additions are general in nature—peculiar problems always crop up, requiring thought and imagination on your part.

Lip—Upper and Lower

Positioning

Patron lies on back, bolstered under knees if desired. Relax patron as much as possible. Operator may work from side or end of table.

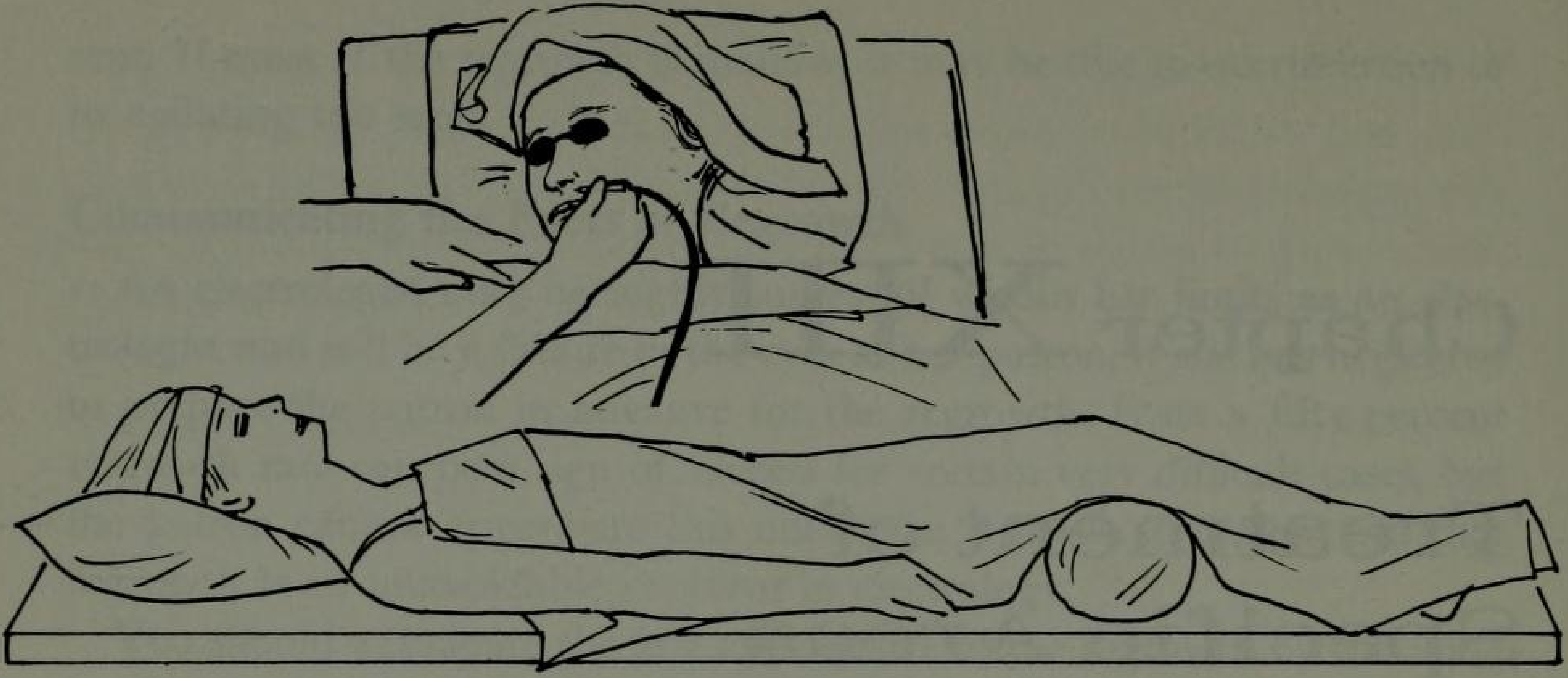


FIGURE 143. *Standard supine position—lip—upper and lower.*

Area Characteristics

Very sensitive in middle of lip, less sensitive toward corners of mouth. Tear ducts are usually activated when working over infra-orbital nerve endings, which lie halfway between corner of mouth and center line of lip. Tears are uncontrollable, but are not necessarily associated with excessive pain. If sneezing is induced when working within a certain small area, avoid this area until the treatment nears its termination.

Pre-Treatment

Apply topical anesthetic, if desired, to skin surface. A cotton roll between lip and teeth aids in some cases. Patron can curl lip between teeth to facilitate insertions also. An ice cube in a plastic bag rubbed frequently over the area is often very effective on extra-sensitive persons.

Suggested Treatment

Use standard face technic. High-frequency intensity should be kept low if small diameter needle is being used.

Use smallest diameter needle on lanugo hair. Match needle diameter to terminal hair types as usual. Always start at the corner of mouth so that current is first applied to nerves farthest from the center. If necessary "find" one or two hairs to treat on the sides so that you *never* start in the middle. Work towards the middle but do not cross the middle. Jump to the opposite corner and work up to the center so that the most sensitive area (under the nose) is done last. This gives synapses time to be dulled to the impulses of pain.

Post Treatment

Cataphorese after blend or galvanic treatment. Roll away from center of lip. Apply usual after-treatment medicaments.

Home Care Instructions

Suggest usual home care with added stress on keeping the area clean. The upper lip is very easily infected from saliva. Perspiration, especially during warm weather, quickly causes follicle infection. Head colds and runny noses also cause infection. Frequent wiping with a germicide will prevent infection when any of these conditions prevail.

If infection does develop, hot epsom salt compresses should be used.

Chin—Front

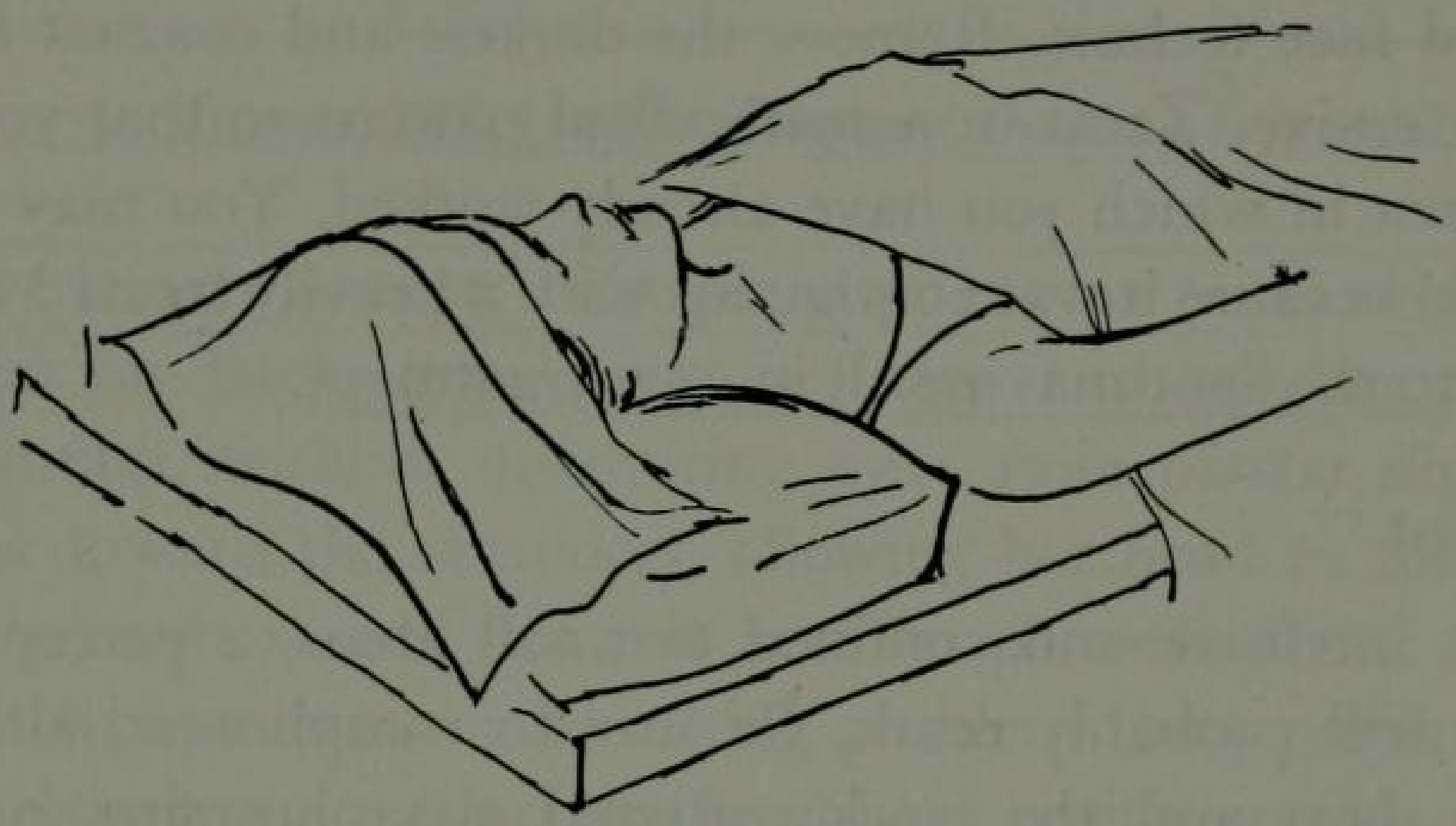


FIGURE 144. *Chin—right side.*

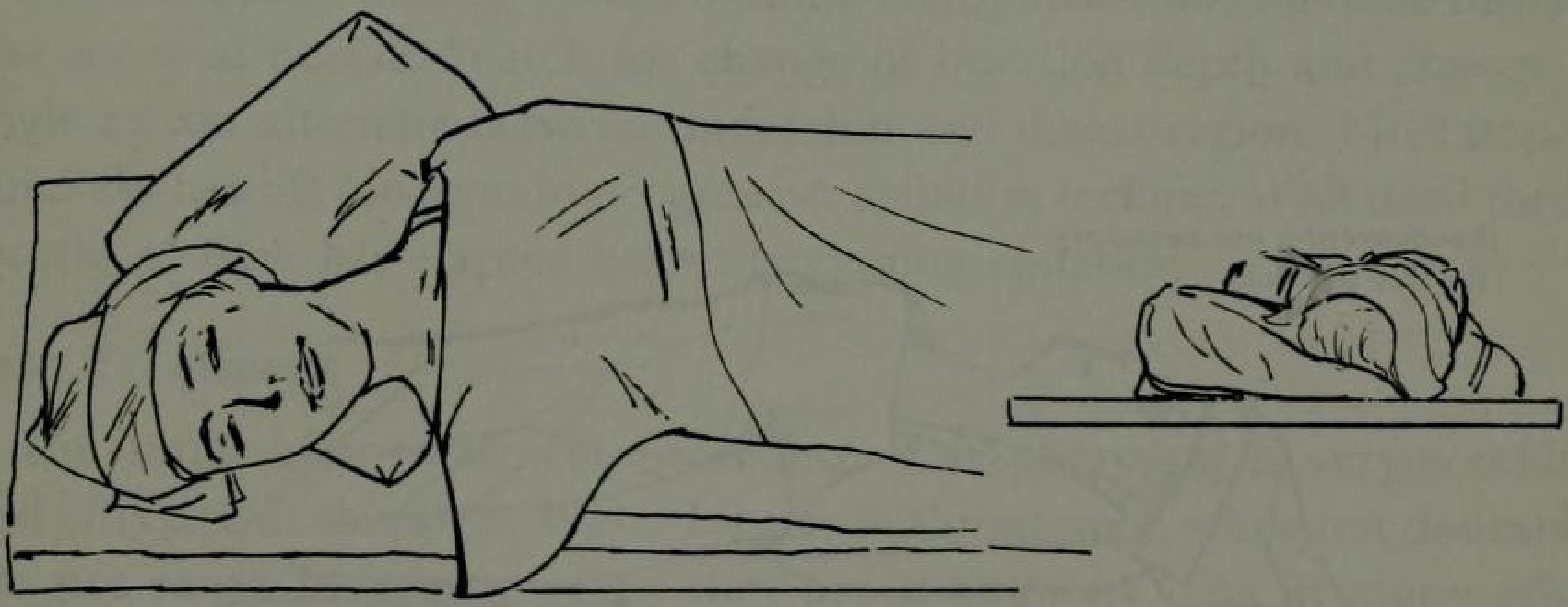


FIGURE 145. *Chin—left side—note pillow prop.*

Positioning

Usually on back for treating right or left chin. Bolster or pillow under knees if needed. If heavy-set, short-necked patron, put pillow under left shoulder to prop at an angle or have patron lie on right side. Operator should not rest arm on patron's chest.

Area Characteristics

Relatively insensitive. The longer the patron has been tweezing, the less sensitive it becomes. The hair growth pattern on women is a random pattern seldom showing groupings of two or three hairs.

If patron has been tweezing, most hairs will be anagen. If patron has been shaving or cutting, some will be in telogen.

Hairs grow at 45° to 90° angle of inclination. Depth: terminal hairs are average to deep.

Suggested Technic

Use standard face technic. Remove the darkest and coarsest hairs first if growth is extensive. Treat in a methodical pattern so that you do not return to an area in which you have already worked. You may have left a hair untreated because it was contiguous with a heavily treated neighbor, and returning to the spot may result in over-treatment.

Post Treatment

If work was intensive and confined to small areas, a perceptible galvanic reaction will probably result. Be sure to cataphorese, although, if treatment was short and the work scattered, cataphoresing is not necessary. Apply standard after-treatment care and give usual home care instructions.

Underchin and Throat

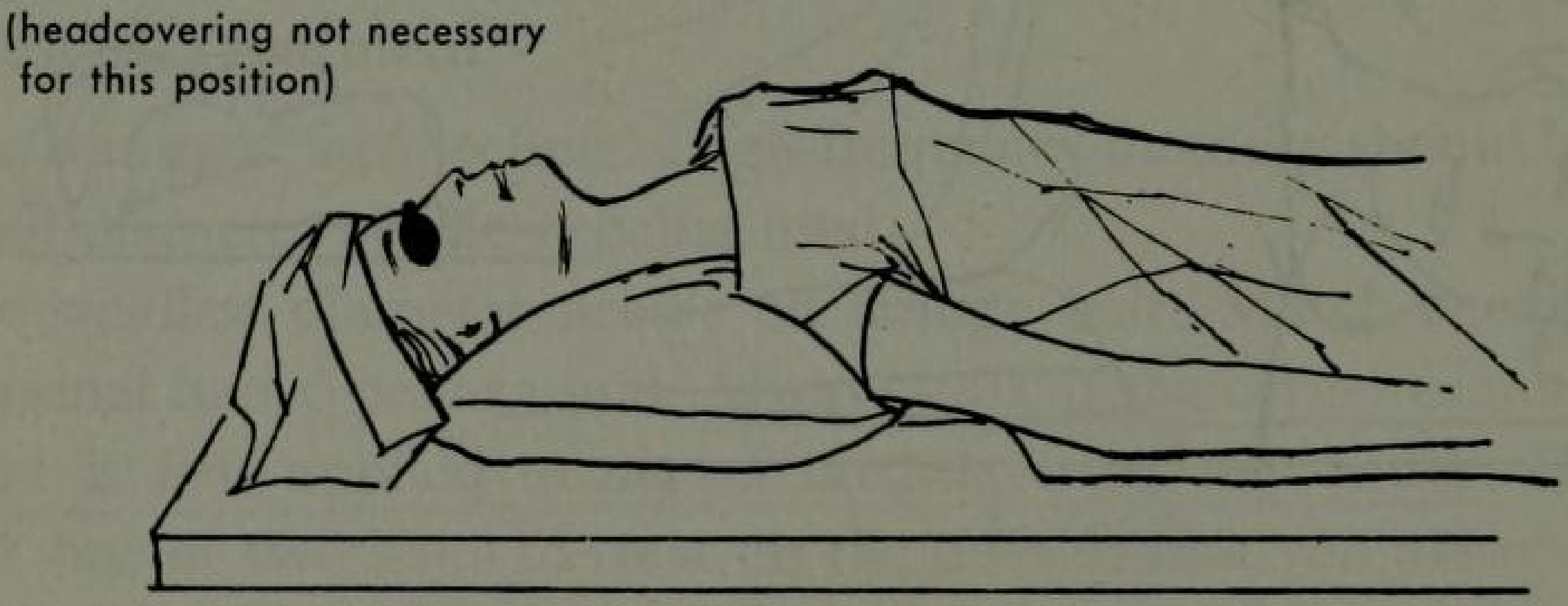

(headcovering not necessary for this position)

FIGURE 146. *Under chin and throat—right side.*

Positioning

This is one of the more difficult areas to work on because patron often refuses to move head back far enough. The correct position can usually

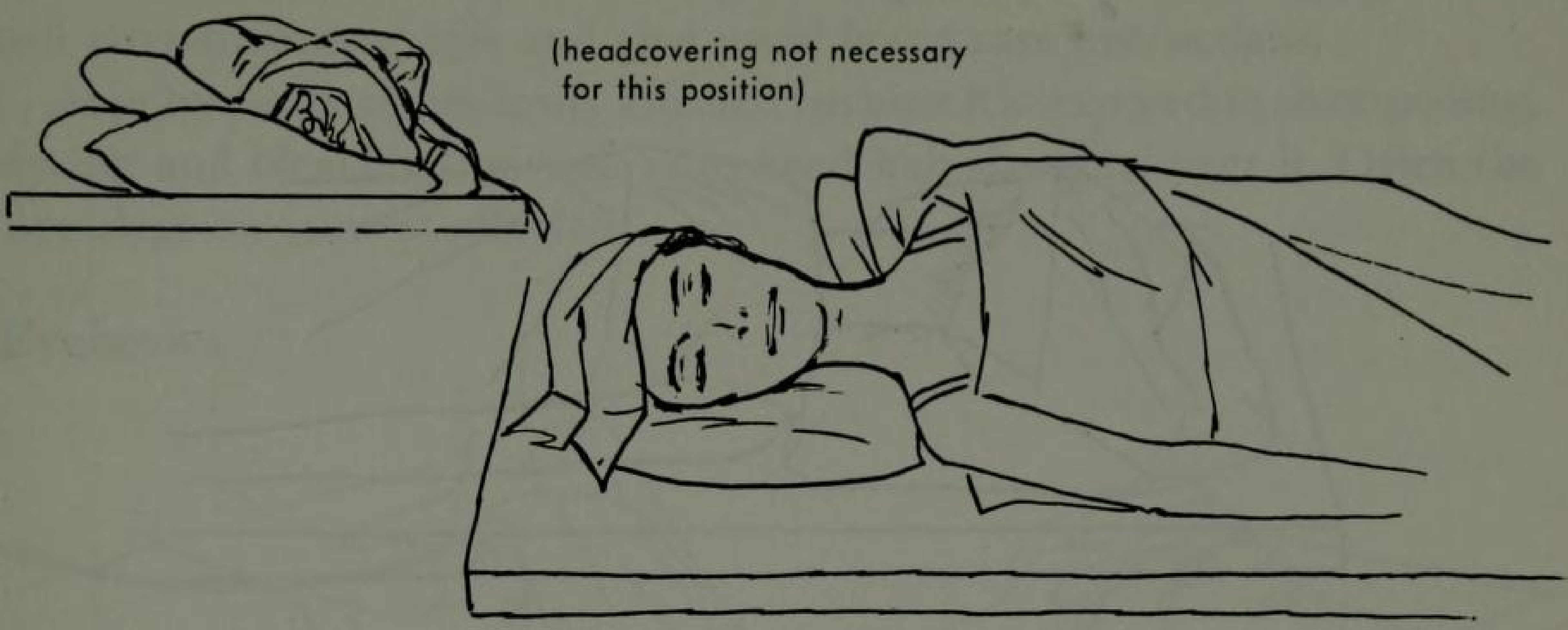

(headcovering not necessary for this position)

FIGURE 147. *Under chin and throat—left side.*

be achieved in two steps: first place pillow as usual under head when patron lies on back, then cover her eyes and tell her to relax. After a few minutes, without uncovering eyes, raise patron slightly and shift the pillow toward the shoulders, allowing her head to tilt back over the pillow. Operator should not rest arm on patron's chest.

Persons with asthma or breathing problems may require propping up of entire upper torso to effect this head-back position comfortably. A wedge pillow is useful for this purpose.

Suggested Technic

Standard face technic. Avoid treating contiguous hairs on male throats. Use taper of needle. Watch for change of insertion depth and change of angle as you alternate between underchin and throat region. Most important! Do not lift too soon in progressive epilation technic. Wait until three-fourths of time has elapsed before beginning epilation.

Post Treatment

Use usual after-treatment procedure. Cataphoresing is very soothing and effective in this area. Water blisters in throat area, while not desirable, are not cause for alarm unless they are contiguous. (As in many other areas, contiguous blisters may lead to scarring.) Lymph crusts disappear in a few days with no visible traces. Area heals fast. Warm weather, which promotes perspiration, can cause pustules after 24 hours.

Side Face

Positioning

Patron lies on back or side. Operator may work from side or end of table.

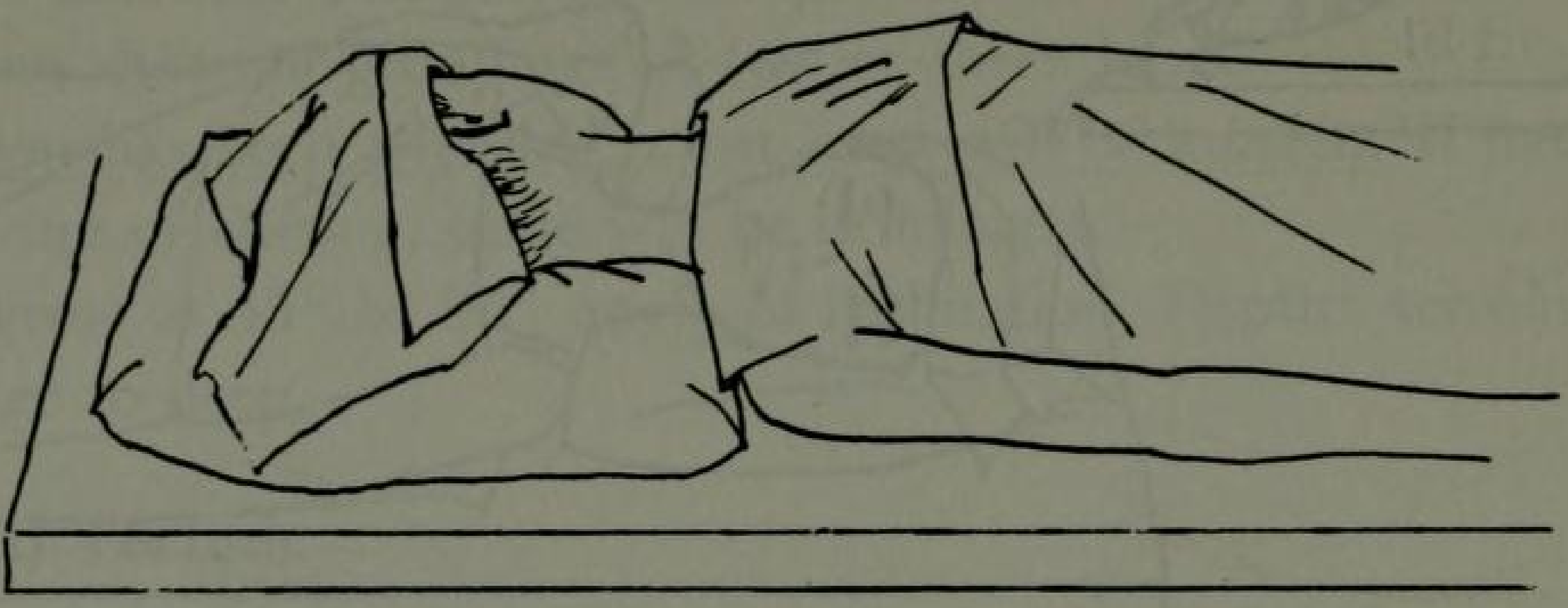


Figure 148. *Side face—right.*

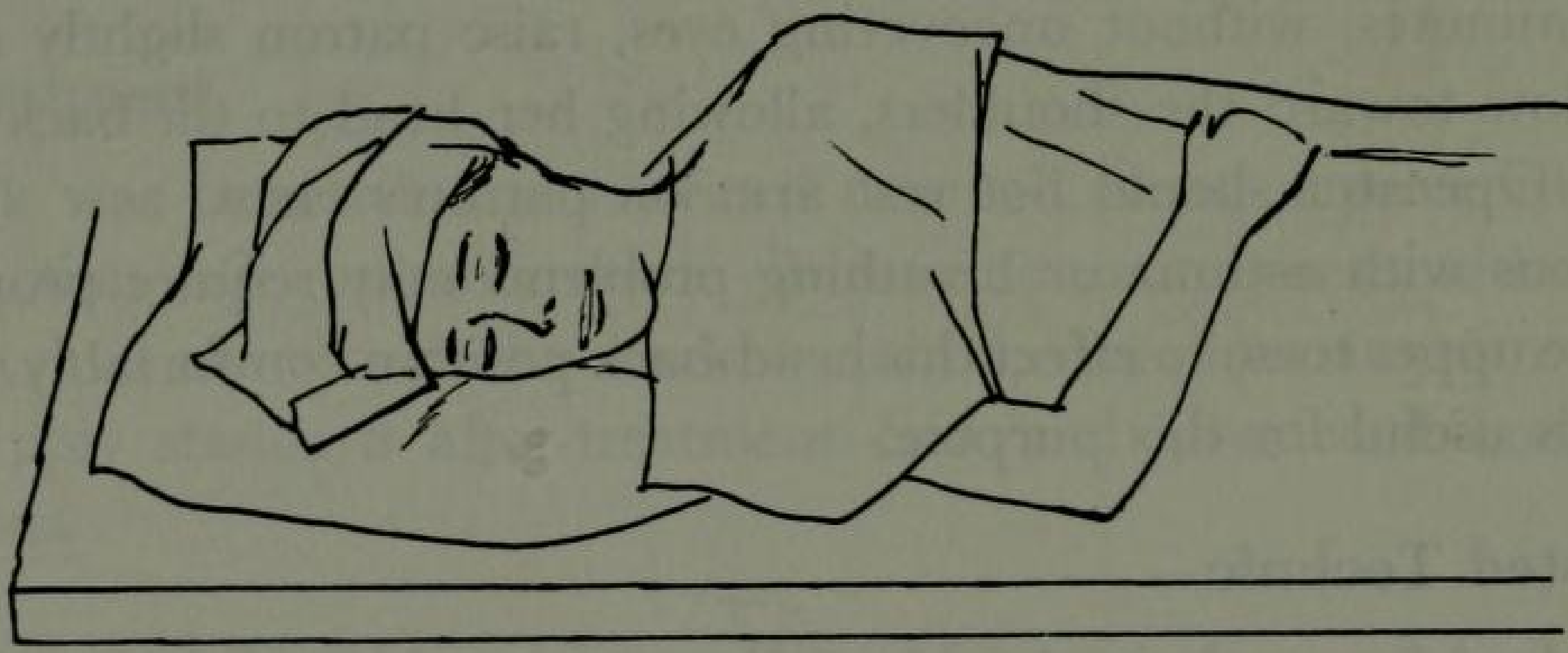


Figure 149. *Side face—left.*

Area Characteristics

Relatively insensitive. On curly haired persons, ingrowing of terminal hair in this area is very common. It is aggravated by tweezing. Patron should be advised to liberate end of embedded hair but not to tweeze prior to appointment.

Suggested Technic

Use standard face technic. Remove the darkest and coarsest hairs first if growth is extensive. Treat in a methodical pattern so that you do not return to an area in which you have already worked. You may have left a hair untreated because it was contiguous with a heavily-treated neighbor, and returning to the spot may result in over-treatment.

Post Treatment

If work was intensive and confined to small areas, a perceptible galvanic reaction will probably result. Be sure to cataphorese. If treatment was short and work scattered, cataphoresing is not necessary. Apply standard after-treatment care and give usual home care instructions.

Area by ear becomes easily infected because it is exposed to shampooing, dyeing and bleaching, as well as to head hair dangling over it. Often the side slept on is most affected.

Eyebrows

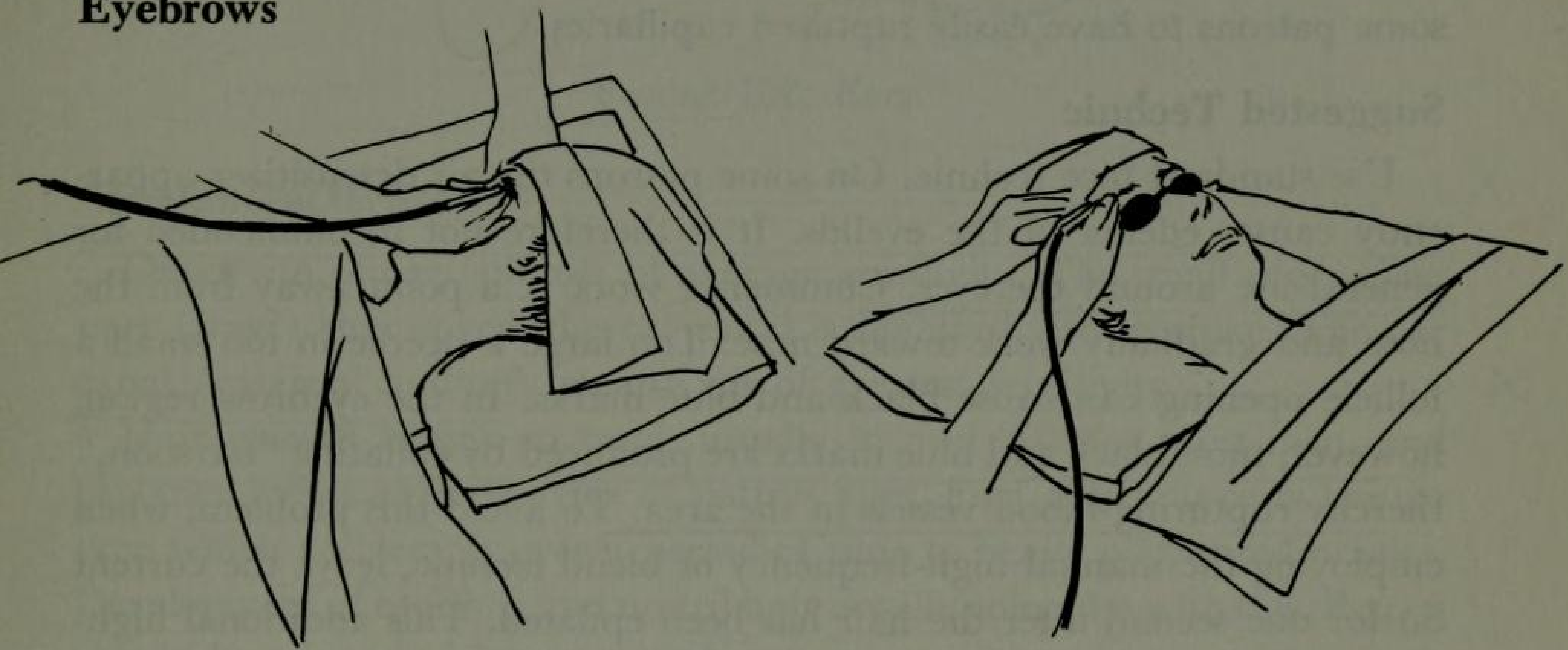


FIGURE 150. *Eyebrows—for side of table operation.*

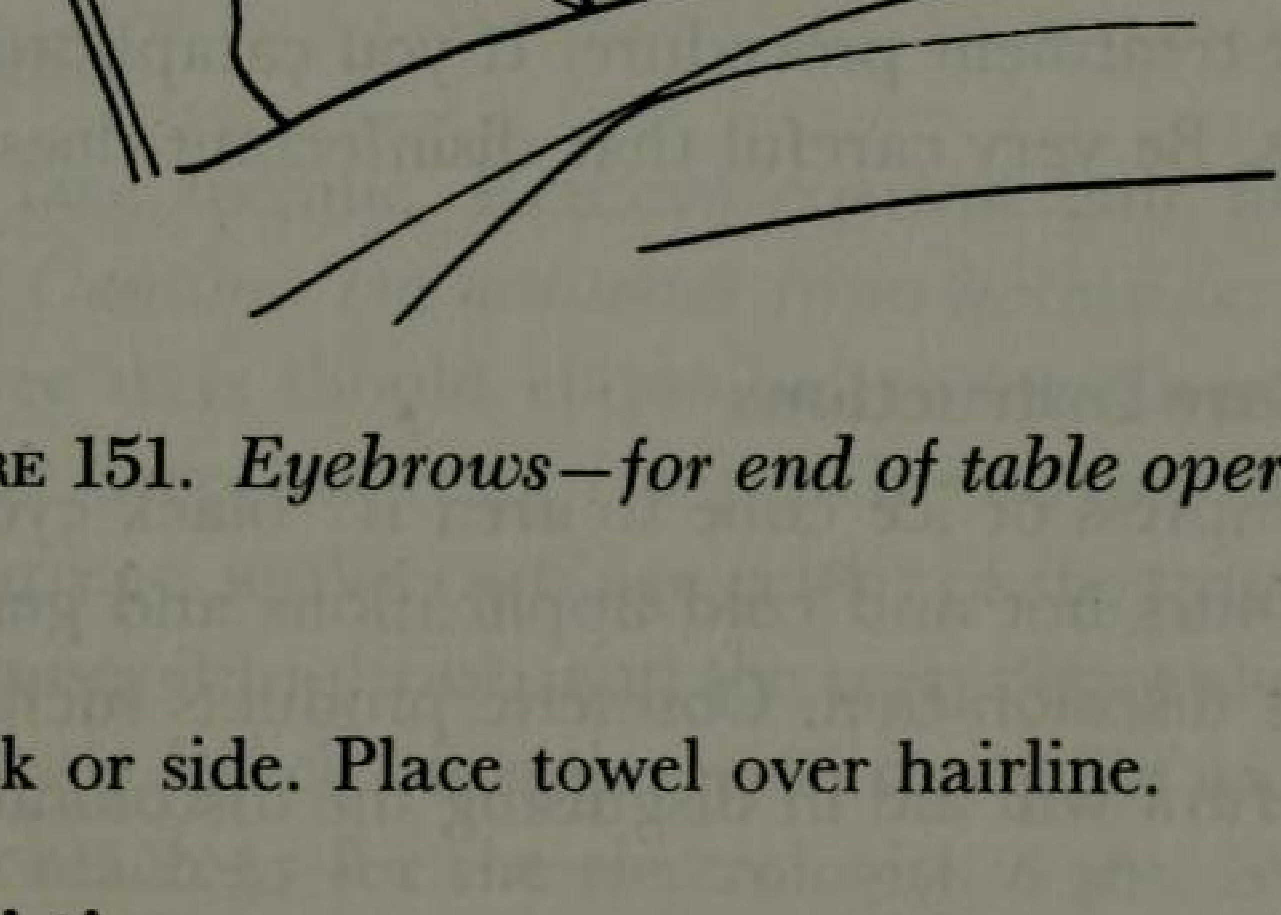


FIGURE 151. *Eyebrows—for end of table operation.*

Positioning

Patron on back or side. Place towel over hairline.

Area Characteristics

Average sensitivity if little tweezing has been done. If patron has tweezed heavily for several years, area is less sensitive.

Skin takes current well on brow proper but great caution is demanded in the area between the brows (above the bridge of nose) because high moisture content creates tendency of high-frequency to act violently on the epidermis.

Hair in the brow region is of medium depth but quite large and bulbous in root structure. At least a .003″ diameter needle should be used. Match diameter to root rather than to hair shaft.

Black eyes can be caused by improper insertion or by the tendency of some patrons to have easily ruptured capillaries.

Suggested Technic

Use standard face technic. On some patrons the air desensitizer apparently causes edema of the eyelids. It is therefore not recommended for general use around the eyes. Commence work at a point away from the nose and gradually work toward nose. Too large a needle in too small a follicle opening can cause black and blue marks. In the eyebrow region, however, most black and blue marks are produced by epilating "too soon," thereby rupturing blood vessels in the area. To avoid this problem, when employing the manual high-frequency or blend technic, leave the current on for one second after the hair has been epilated. This additional high-frequency heat apparently "seals" ruptured capillaries.

If a capillary should break, apply finger pressure to the affected area immediately. A cold object or cotton wet with disinfectant is even more effective. Maintain pressure for about 90 seconds.

Do not work on the top of the brow except to remove an odd point or peak. Let the patron decide on the line if possible. In most cases all that is necessary is to permanently remove the hair that reappears from her tweezing.

Post Treatment

Use usual after-treatment procedure. If you cataphorese do not run the roller over eyelids. Be very careful that disinfectant does not run into the eyes.

Special Home Care Instructions

Apply cold compress or ice cube to area if "black eye" was produced. After 12 to 24 hours hot and cold applications and gentle massage will speed dispersal of discoloration. Cosmetic products such as Max Factor's *Erase* or *Cover Mark* will aid in disguising the discoloration.

Ears (Male problem usually)

Positioning

Lie patron on side, as in side face position. Corks or cotton rolls behind the ear can be used as props, while adhesive tape will hold rim of ear firmly in place if needed.

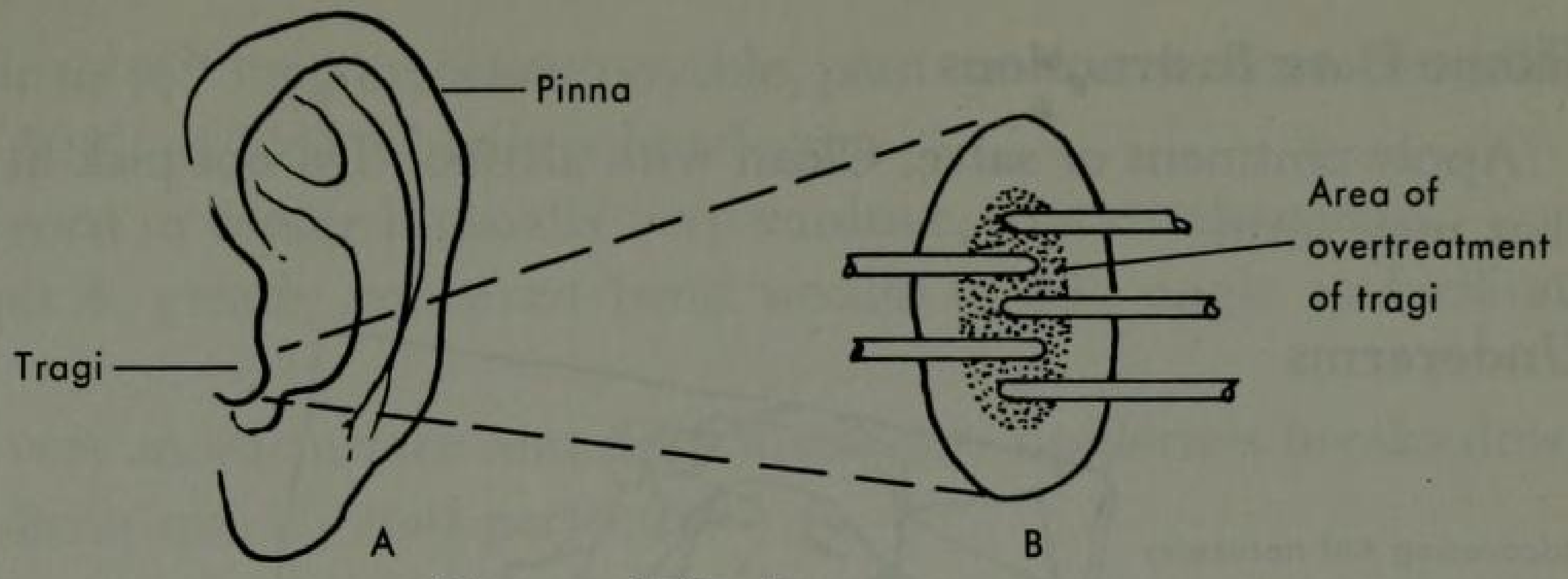


FIGURE 152. *Ears.*

Area Characteristics

Outer rim of ear (pinna) of average sensitivity. The small protruding part (tragi) that covers the ear canal is slightly more sensitive. The ear canal (external auditory meatus) is of greatest sensitivity.

Hair growth begins on tragi, usually in mid 30's for most men, and becomes increasingly heavier as patron ages. First appearance is lanugo type which accelerates over a period of time to heavy pigmented bristles. Development of eyebrow and nostril hair usually coincides with this. Patron should be advised of future growth pattern and subsequent need for semi-yearly or yearly visit. Since not all lanugo hair will transform to bristles, concentrate on the obvious long or coarse hairs.

Pre-Treatment

Apply alcohol with Q-Tip or cotton swab applicator. *Caution.* Do not allow any disinfectant to run into the ear canal. Put cotton plug in canal for extra protection if necessary. Q.A.C. may be used but waxiness of ear region is more thoroughly removed with 70% alcohol.

Suggested Technic

Use standard face technic. Remove coarsest hair first. Do not work contiguous hairs. *Caution. Do not work from both sides of tragi.* See Fig. 152. At least three days should elapse before treating opposite side. Because the hairs are deep, inserting from each side overlaps the destructive patterns of the currents at the cartilage center of the tragi. Over-treatment of the cartilage causes it to shrink, and the tragi diminishes in size.

In some cases hair follicles may be located too far within the ear canal for the needle to reach or for the electrologist to see. No attempt should be made to remove these hairs. Since ear canal infection can be serious, tell the patron to cut rather than tweeze hair growing from the canal.

Post Treatment

Usual post treatment. Do not cataphorese.

Home Care Instructions

Apply ointment or salve. Clean with alcohol. Do not pick at any crusts that may form.

Underarms

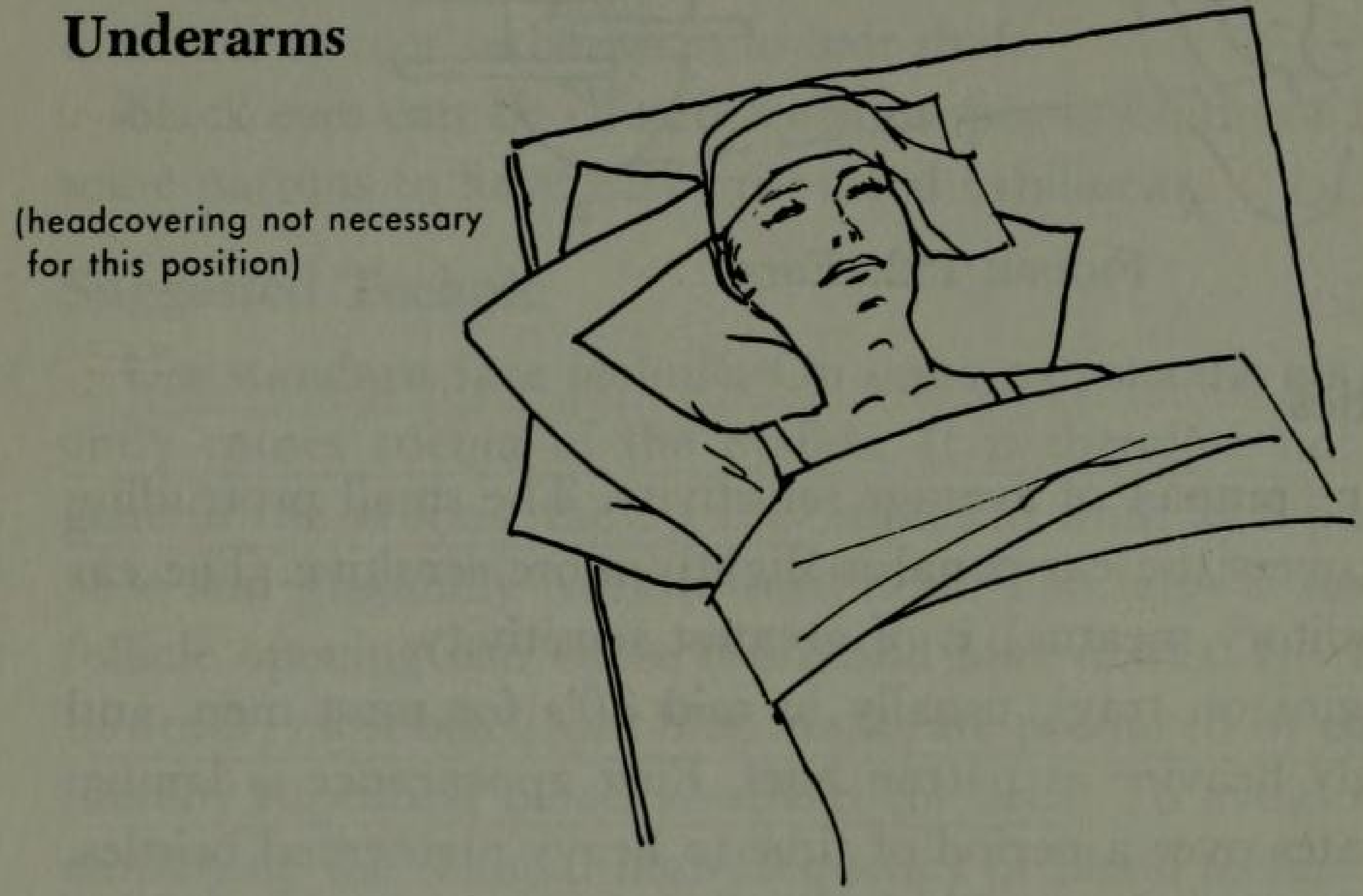

(headcovering not necessary for this position)

FIGURE 153. *Underarms—right.*

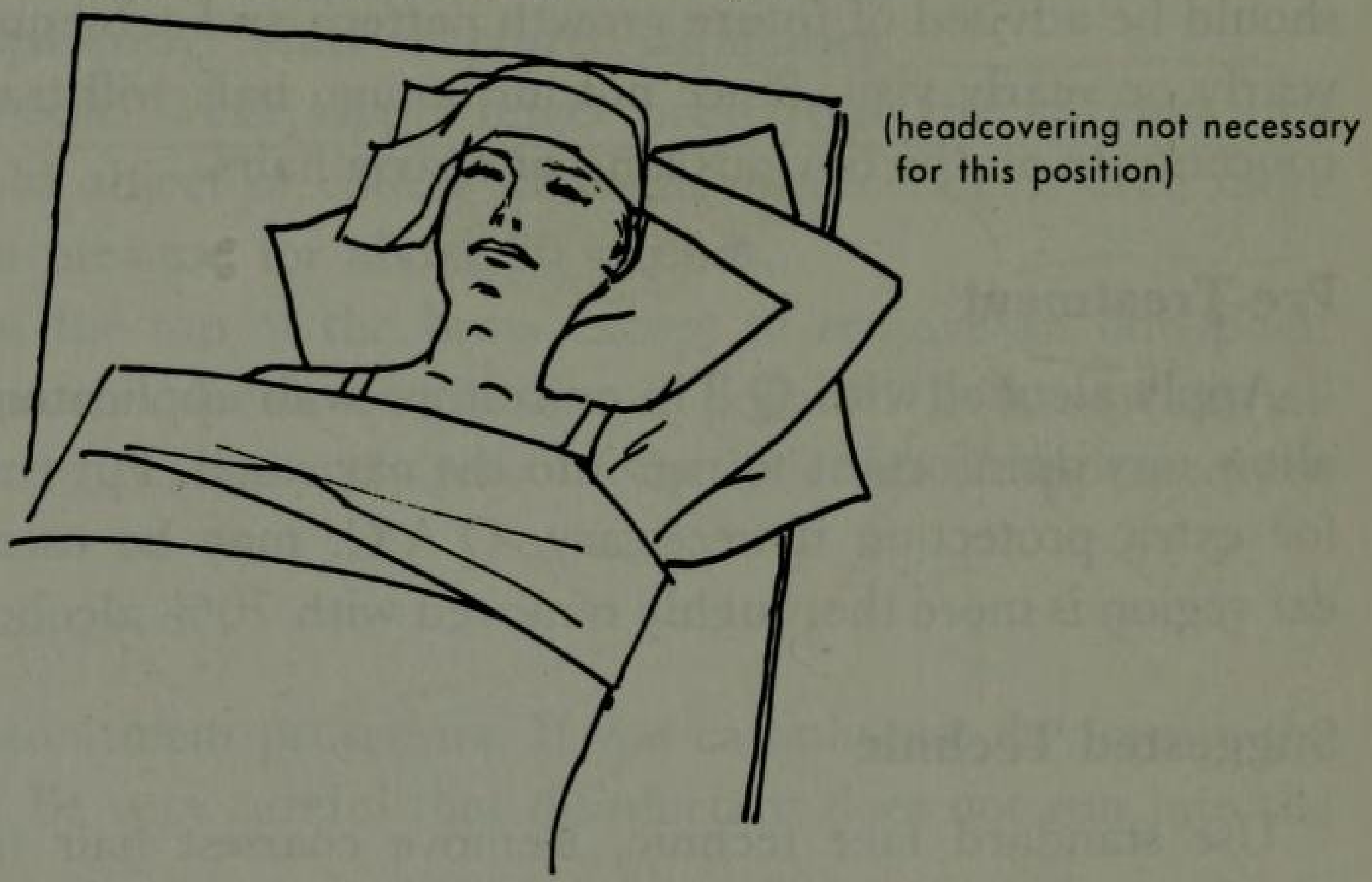

(headcovering not necessary for this position)

FIGURE 154. *Underarms—left.*

Positioning

Patron lies on back with arm overhead. Put pillow under raised arm. To raise armpit higher above table use additional pillow under shoulder to tilt patron away from you. Drape with towels on either side of armpit. Tuck towel under bra if convenient.

Area Characteristics

Hair direction changes in crease of armpit growing toward elbow on one side of the dividing line and toward waist on chest side of dividing line. Hair inclination angle is 45° to horizontal.

Clip hair to 1/4″ long or, when possible, plan treatment dates according to shaves. 50% to 75% of hair is in telogen.

Muscle cord in center is usually very sensitive, so start elsewhere.

If armpit is greatly concaved bend needle to 45° angle to facilitate insertion.

Expect very moist surface and deep insertions. Epidermis breaks down easily but heals quickly and perfectly.

Suggested Technic

Use body technic if possible. Use face technic over sensitive muscle area.

Home Care Instructions

Use no deodorant. Carry small bottle of Bactine or Q.A.C. and wipe armpit every three hours to control odor. Dress shields or washable garments should be worn. Antiseptic powders are also of value.

Back and Shoulders

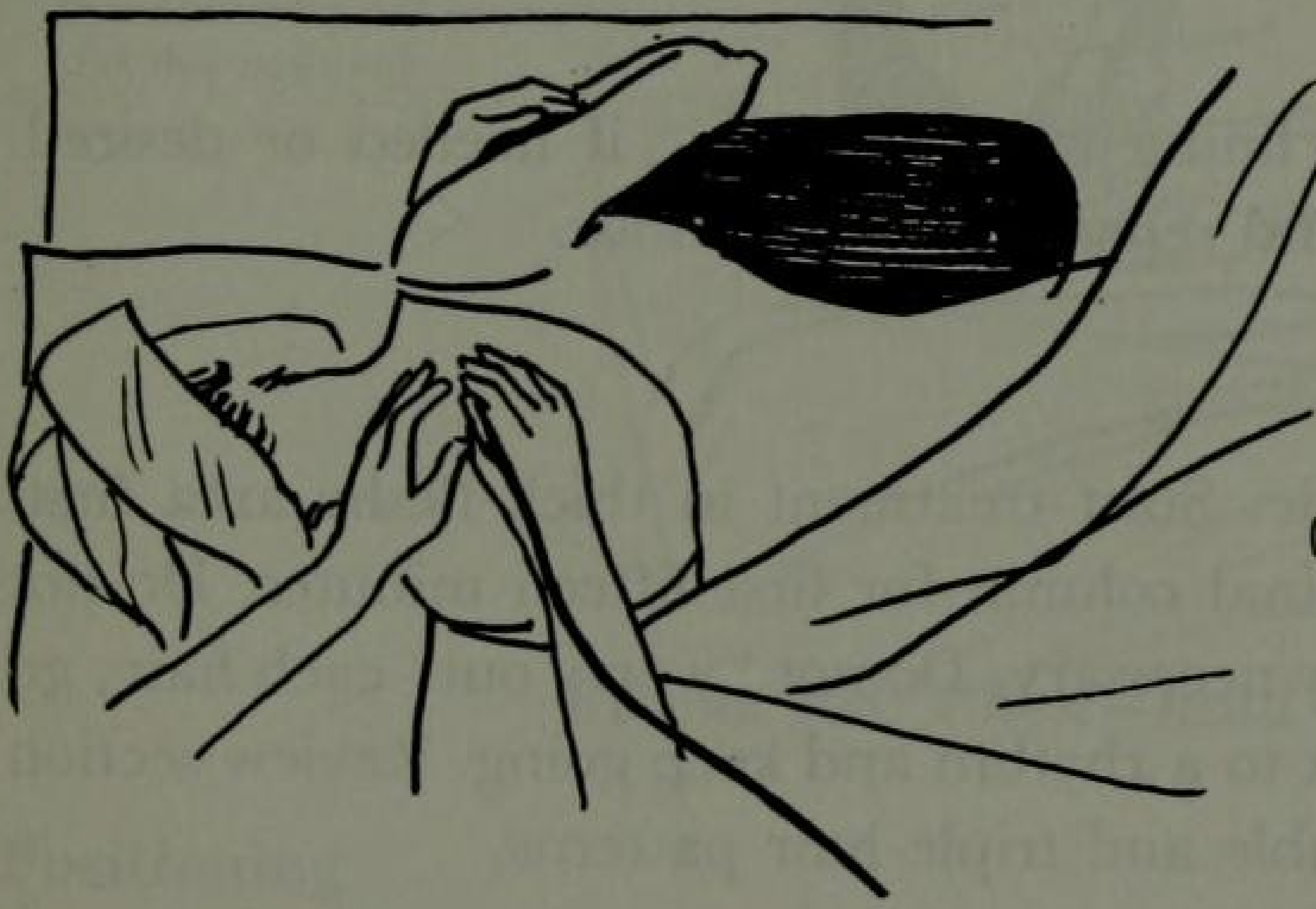
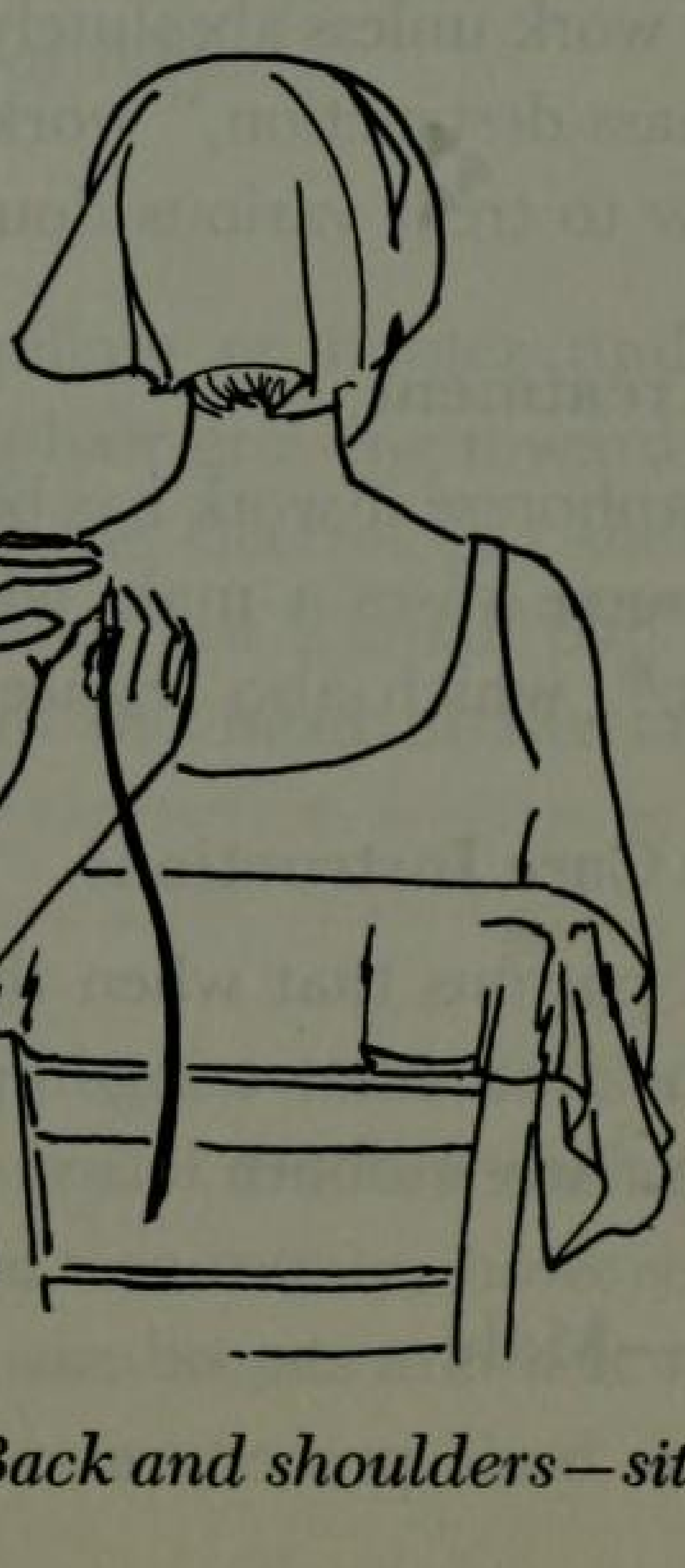


FIGURE 155. *Back and shoulders—prone.*



(headcovering not necessary for this position)

FIGURE 156. *Back and shoulders—sitting.*

Positioning

Observe hair direction *before* positioning patron to determine whether sitting position or prone position would be most feasible. A straight forward insertion is always preferred.

When working on a patron's back or side farthest from you prop patron at angle by putting a pillow or bolster under far side.

Area Characteristics

Hirsuteness of back and shoulder region is mostly a male problem. On women the excess hair pattern is usually confined to center back and is of accelerated lanugo type rather than the terminal hair type so common with the male. The hair direction over the shoulder blade usually slants towards the spinal column. Over the spinal column the hair grows straight downward. Greatest density per square inch is over the spinal column, which is also the most sensitive and the most moist. Top of shoulders are very dry and of average sensitivity. Thick fleshy areas on either side of shoulder blade are least sensitive.

Pre-Treatment

Apply topical anesthesia, liniment or analgesic if needed or desired. Massage well into the skin and repeat every half hour.

Suggested Technic

Use standard body technic. Start treatment in thick fleshy area first. Never treat over bone or spinal column for first fifteen minutes. Do not scatter work unless absolutely necessary. Do not "worry out" each hair; go for "mass destruction," work to a rhythm and keep going. Review section on how to treat various double and triple hair patterns.

Post Treatment

Cataphorese if work has been concentrated. Apply usual after-treatment or in some cases a male will prefer a non-greasy medicament like Kip-Tannic®, which also reduces lymph crust formations.

Home Care Instructions

Tell patrons that when they are showering or bathing not to rub soap over the area. Showering in plain hot water promotes blood supply, speeds healing. Any sunburn lotion or salve may be applied if area feels hot or sore.

Chest—Male

Same basic procedure as for back and shoulders, except for position.

Chest and Breasts—Female

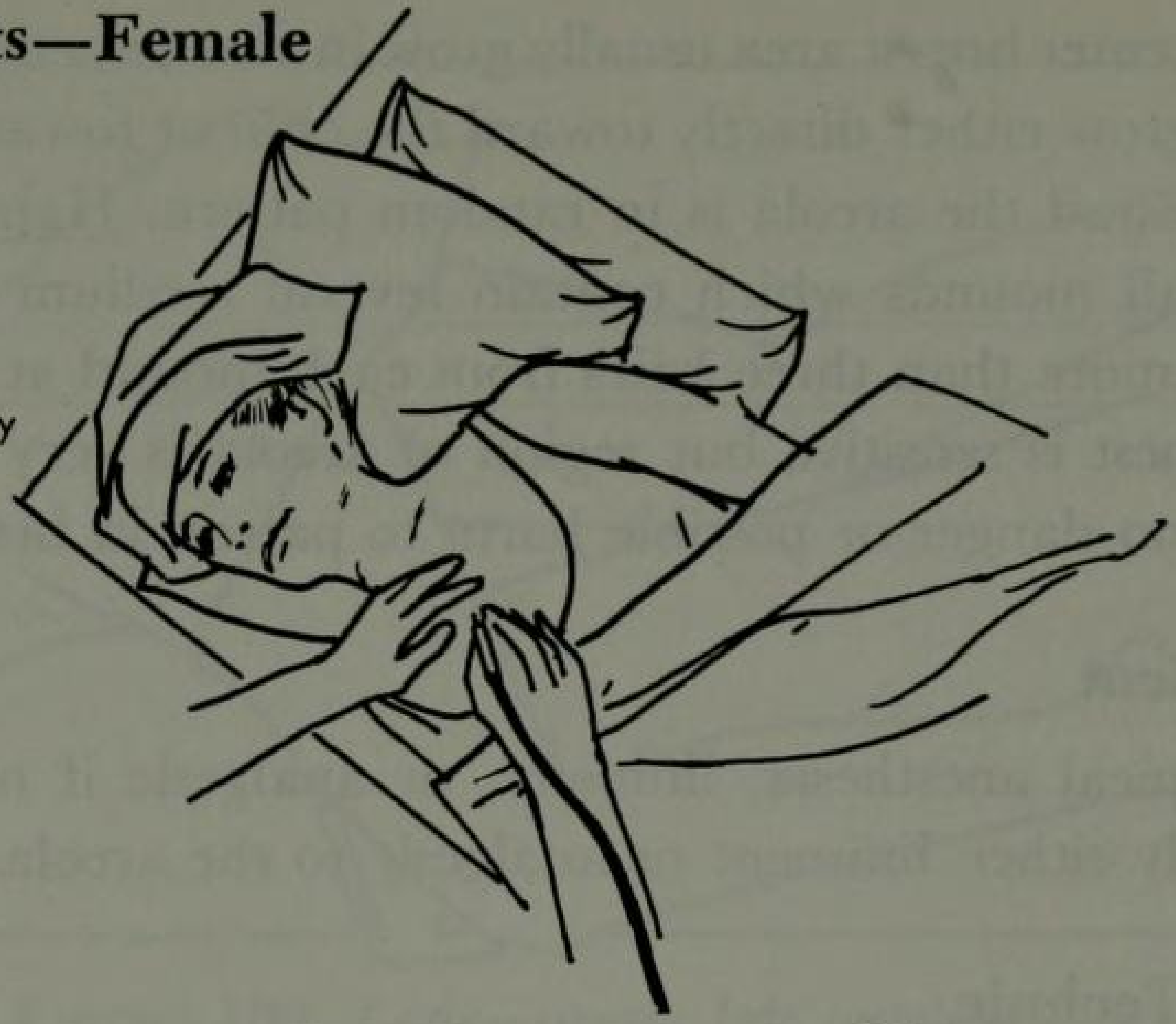


FIGURE 157. *Chest—side of table.*

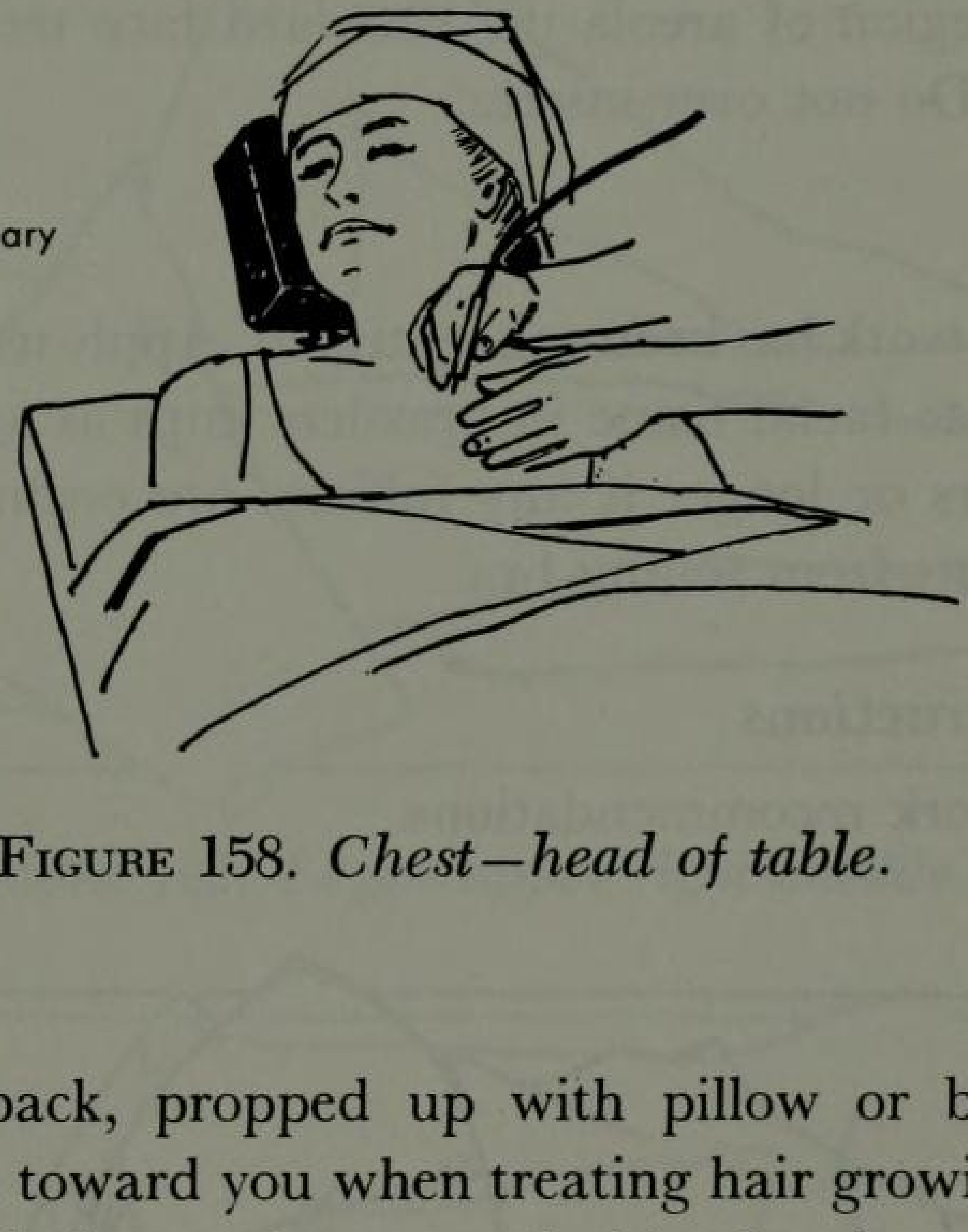


FIGURE 158. *Chest—head of table.*

Positioning

Patron lies on back, propped up with pillow or bolster under far side to angle patron toward you when treating hair growing toward waist.

For center chest hair growing toward chin the electrologist should sit at the head (right end) of the table. No pillow, just a small pad under patron's head. Patron should be as far up to the head of the table as possible, or use special head support.

Area Characteristics

Chest growth on the female can vary from a few hairs on the outer edge of the pigmented ring surrounding the nipple (areola mammae), to extensive coverage of the entire breast. Most commonly, however, the average case involves the center line between the breasts and a few hairs surrounding the areola.

Hairs in center breast area usually grow in two directions from a parting line. Hairs grow either directly toward the chin or toward the waist. Hair direction around the areola is in random pattern. Hairs tend to concentrate in small mounds which contain several medium to deep hair. Do not remove more than three hairs from each mound at one treatment.

Center chest is sensitive but region of areola is very sensitive.

There is no danger or possible harm to patron in breast hair removal.

Pre Treatment

Apply topical anesthesia, liniment or analgesic if needed or desired. Do not apply either liniment or analgesic to the areola.

Suggested Technic

On center chest start with standard face technic. After 10 or 15 minutes try body technic. Let patron decide on the technic which is most tolerable. On breast and region of areola use standard face technic. Check needle depth carefully. Do not over-insert.

Post Treatment

Cataphorese if work has been concentrated. Apply usual after-treatment. Have patron place facial tissue in brassiere cups as added protection for the next 24 hours or longer if any follicles are oozing lymph. This also keeps medicaments from soiling bra.

Home Care Instructions

Usual body work recommendations.

Legs—Upper

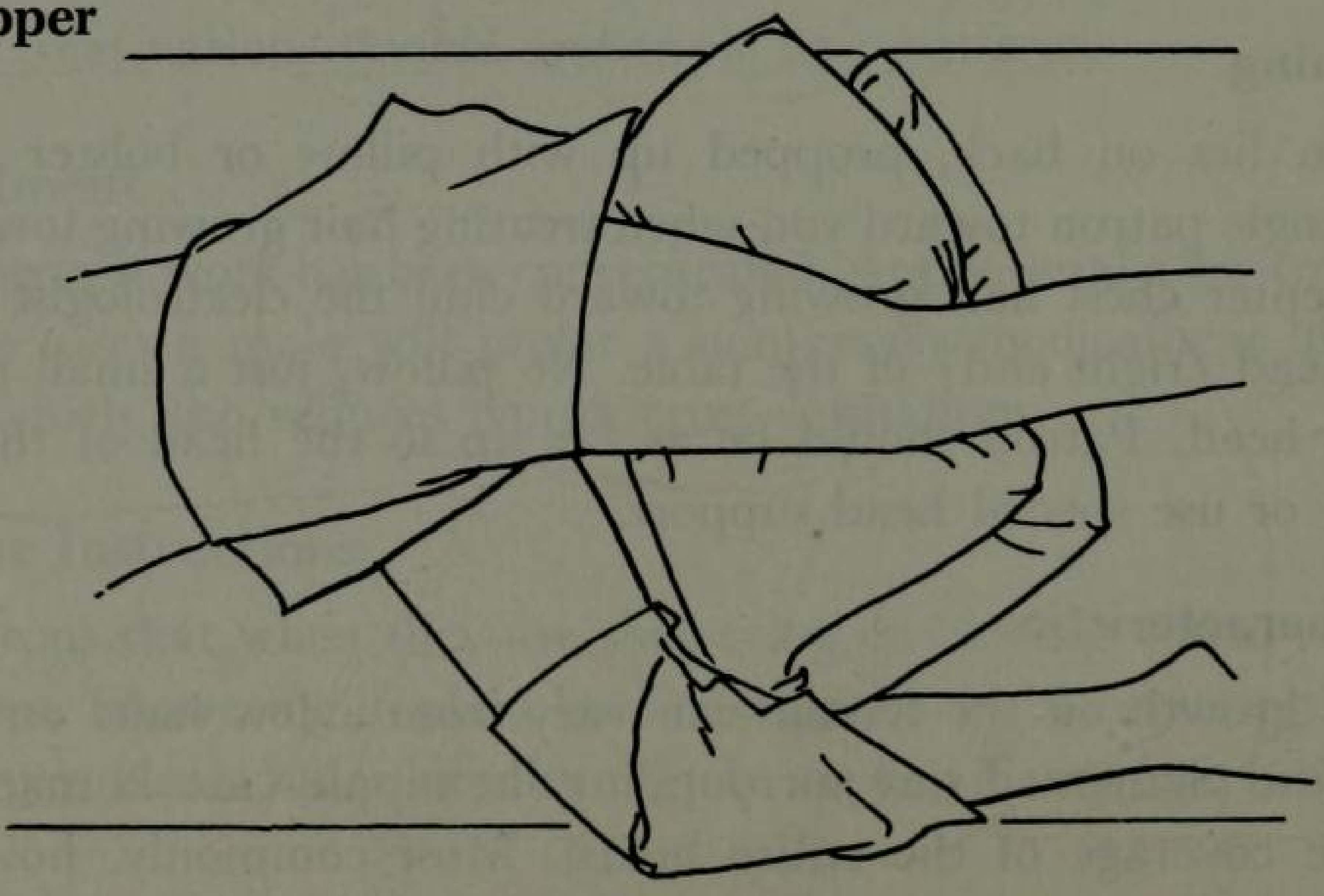


FIGURE 159. *Legs—upper right inside.*

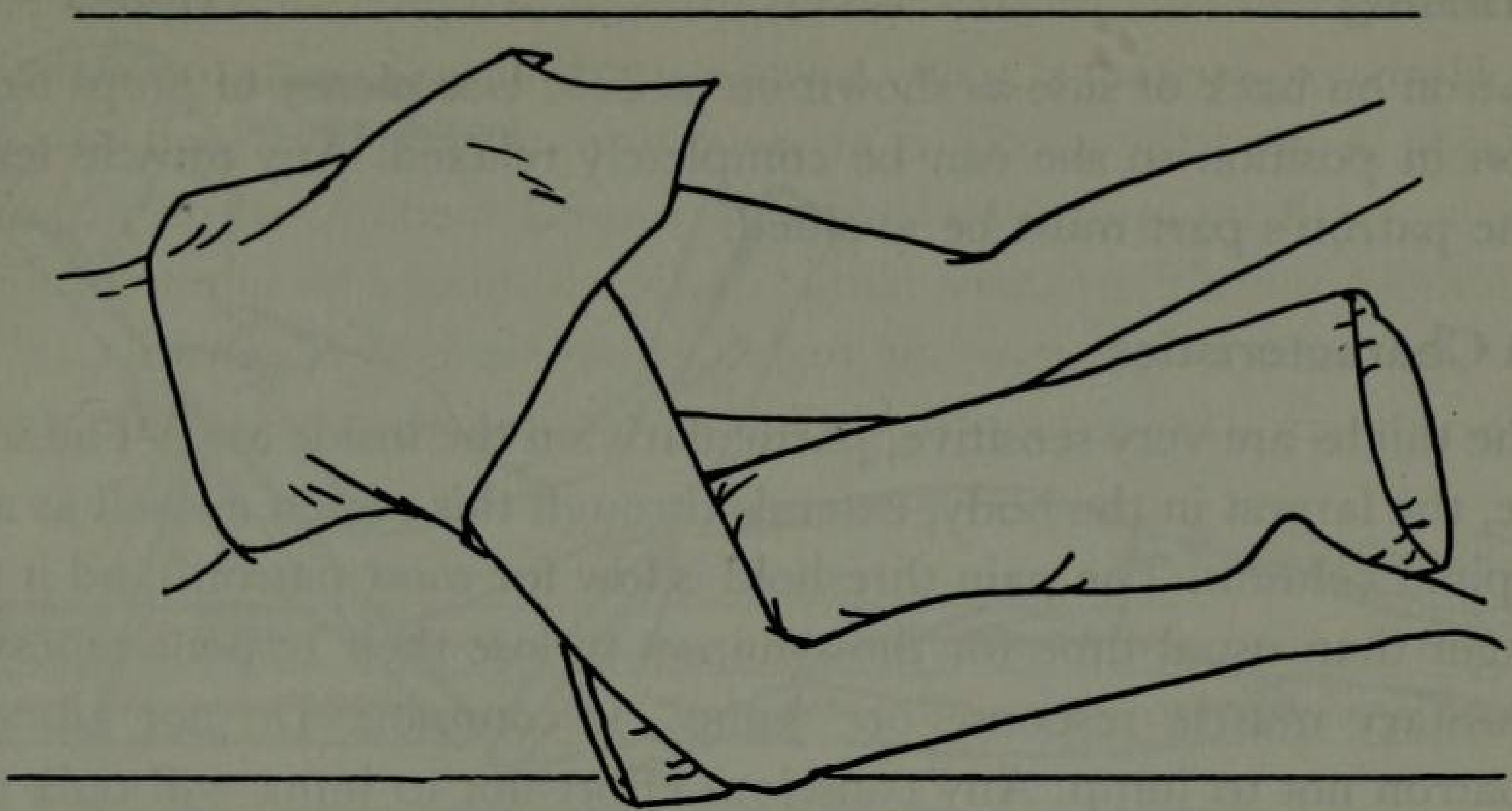


FIGURE 160. *Legs—upper left outside.*

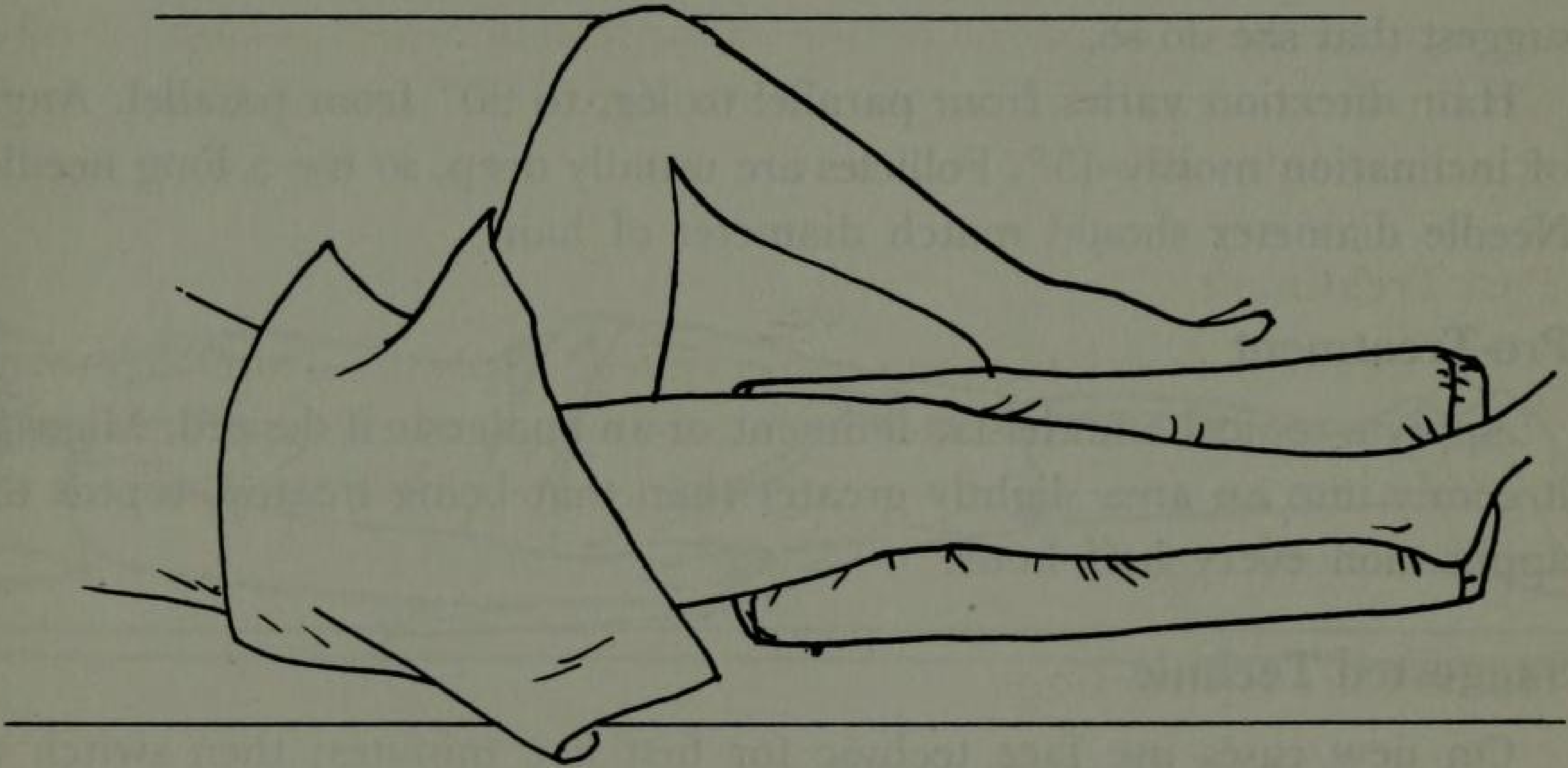


FIGURE 161. *Legs—upper right outside.*

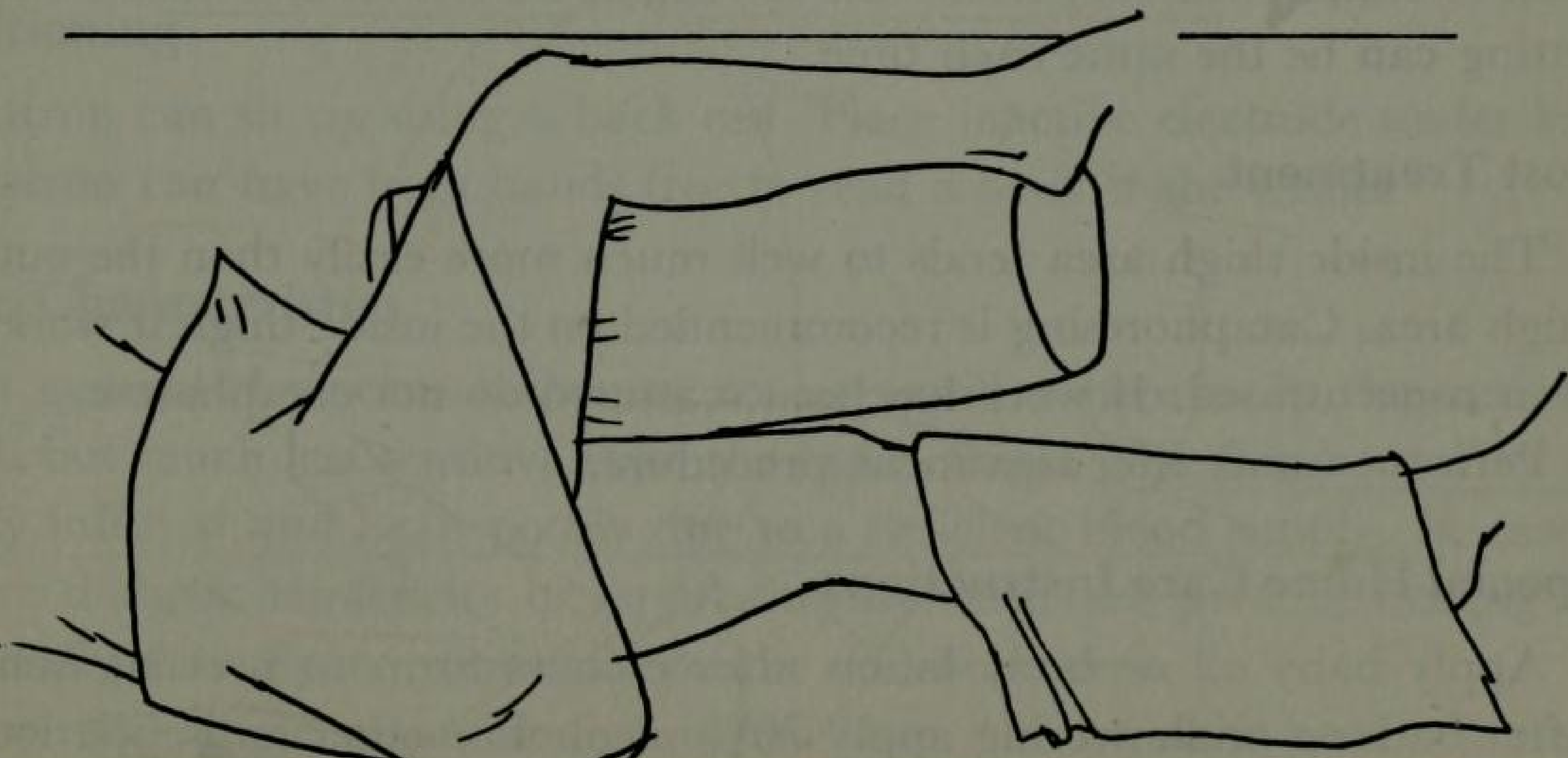


FIGURE 162. *Legs—upper left inside.*

Positioning

Patron on back or side as shown on p. 275. Use plenty of props to hold patron in position so she can be completely relaxed. Any muscle tension on the patron's part must be avoided.

Area Characteristics

The thighs are very sensitive, particularly on the inside area. The sciatic nerve, the largest in the body, extends through this region as well as along the spinal column. The pain threshold is low for most patrons and it takes a longer than usual time for the synapses to lose their responsiveness. An involuntary muscle response or "jump" is common. Do not admonish the patron not to jump. Any conscious effort not to jump will only make her more tense, worsening the problem. Tell her instead that the jump does not bother you. If the patron can obtain sedatives from her doctor, suggest that she do so.

Hair direction varies from parallel to leg, to 90° from parallel. Angle of inclination mostly 45°. Follicles are usually deep, so use a long needle. Needle diameter should match diameter of hair.

Pre-Treatment

Apply a topical anesthesia, liniment or an analgesic if desired. Massage it gently into an area slightly greater than that being treated, repeat the application every half hour.

Suggested Technic

On new cases use face technic for first five minutes; then switch to body technic. After two or three visits start off with body technic. Patron's pain tolerance will vary from visit to visit, so do not assume that machine setting can be the same each time.

Post Treatment

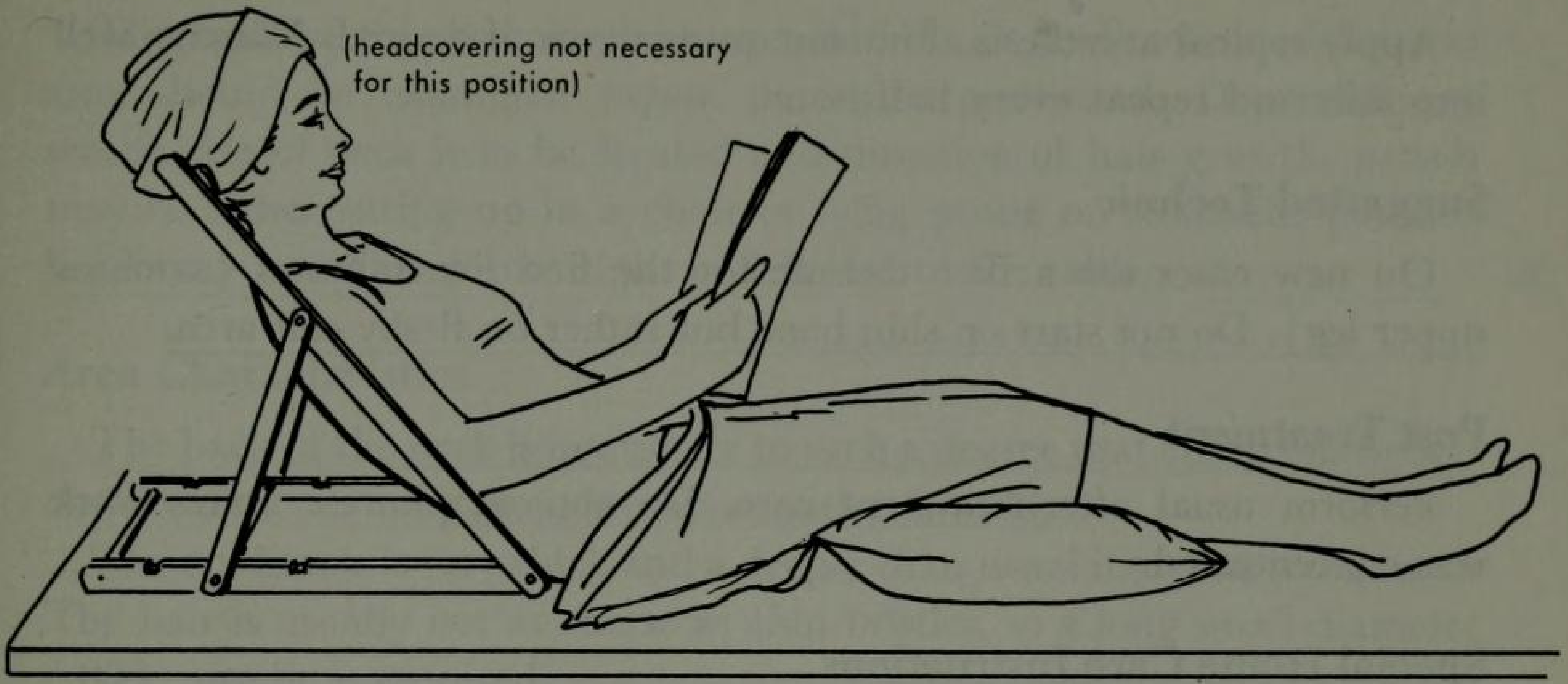
The inside thigh area tends to welt much more easily than the outside thigh area. Cataphoresing is recommended on the inside thigh if work has been concentrated. If work has been scattered do not cataphorese.

Perform usual after-treatment procedure.

Special Home Care Instructions

Apply baby oil or body lotion after eschars form to prevent itching. After bathing or showering apply 70% alcohol or other antiseptic lotion, followed, if needed, by baby oil or body lotion.

Legs—Lower



(headcovering not necessary for this position)

FIGURE 163. *Legs—lower—back rest.*

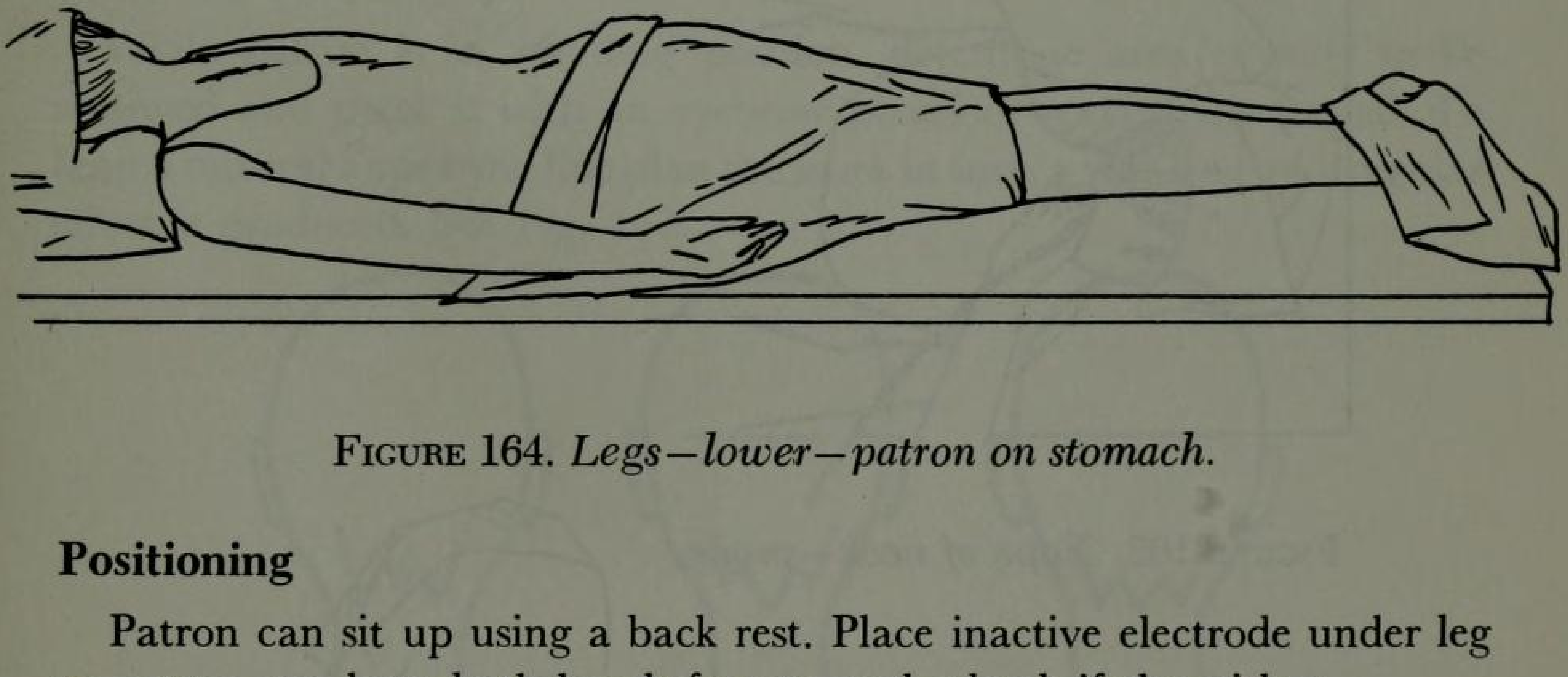


FIGURE 164. *Legs—lower—patron on stomach.*

Positioning

Patron can sit up using a back rest. Place inactive electrode under leg so patron can have both hands free to read a book if she wishes.

Area Characteristics

In general the nerve responses are as sensitive here as in the outside thigh but much less sensitive than the inside thigh. The shin-bone area is easily infected and heals poorly due to a deficient blood supply. In cases where diabetic tendencies or circulatory ailments are present, healing is especially slow. Space your work on the shin-bone area.

Insertion angle of inclination is less than 45° on shin bone. Almost horizontal in some cases.

Pre-Treatment

Apply topical anesthesia, liniment or analgesic if desired. Massage well into skin and repeat every half hour.

Suggested Technic

On new cases use a face technic for the first five minutes (same as upper leg). Do not start on shin bone but rather on fleshy calf area.

Post Treatment

Perform usual after-treatment care. Do not cataphorese unless work was concentrated.

Special Home Care Instructions

See upper leg recommendations.

Nape of Neck—Neckline

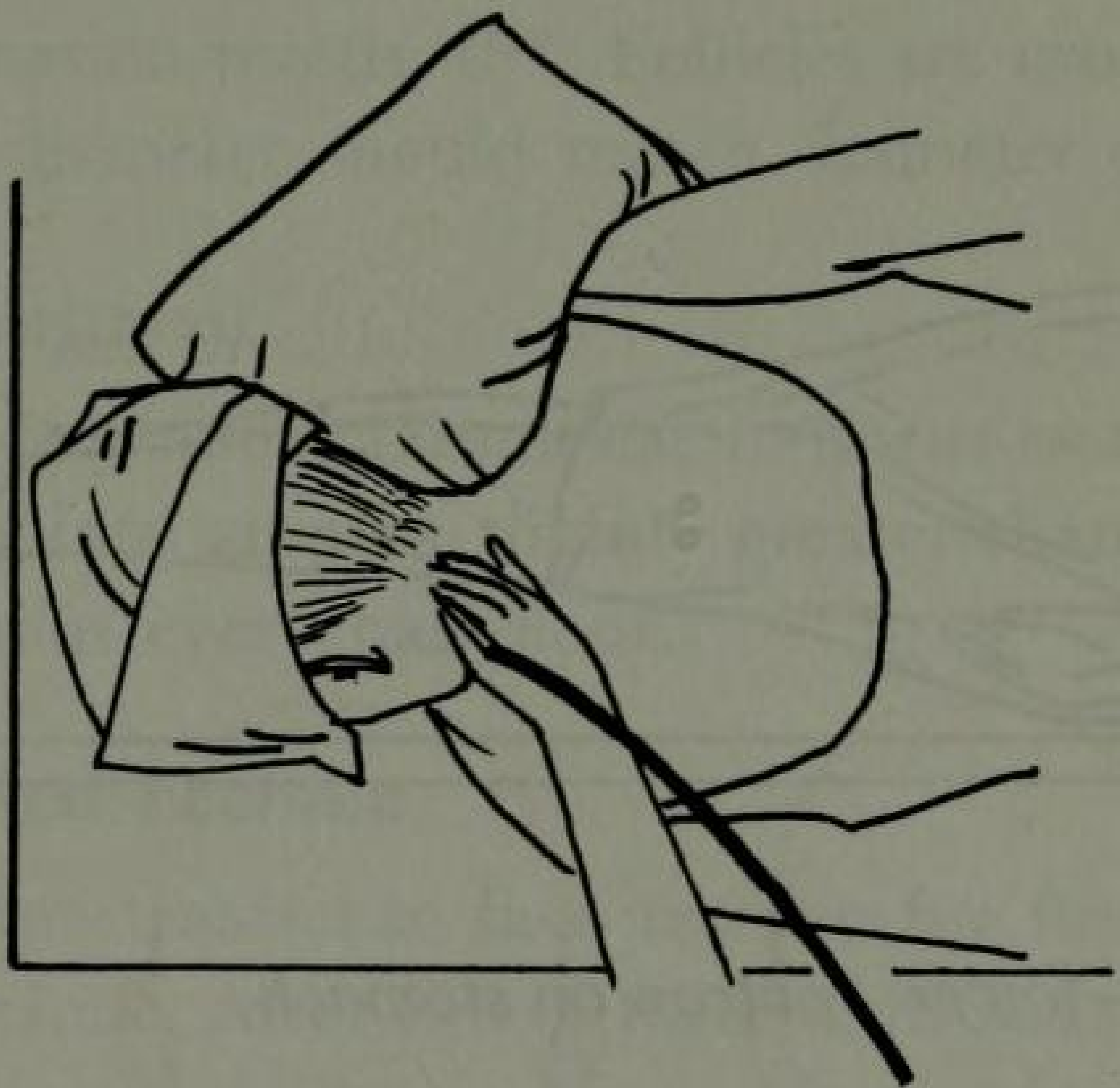


FIGURE 165. *Nape of neck—prone.*

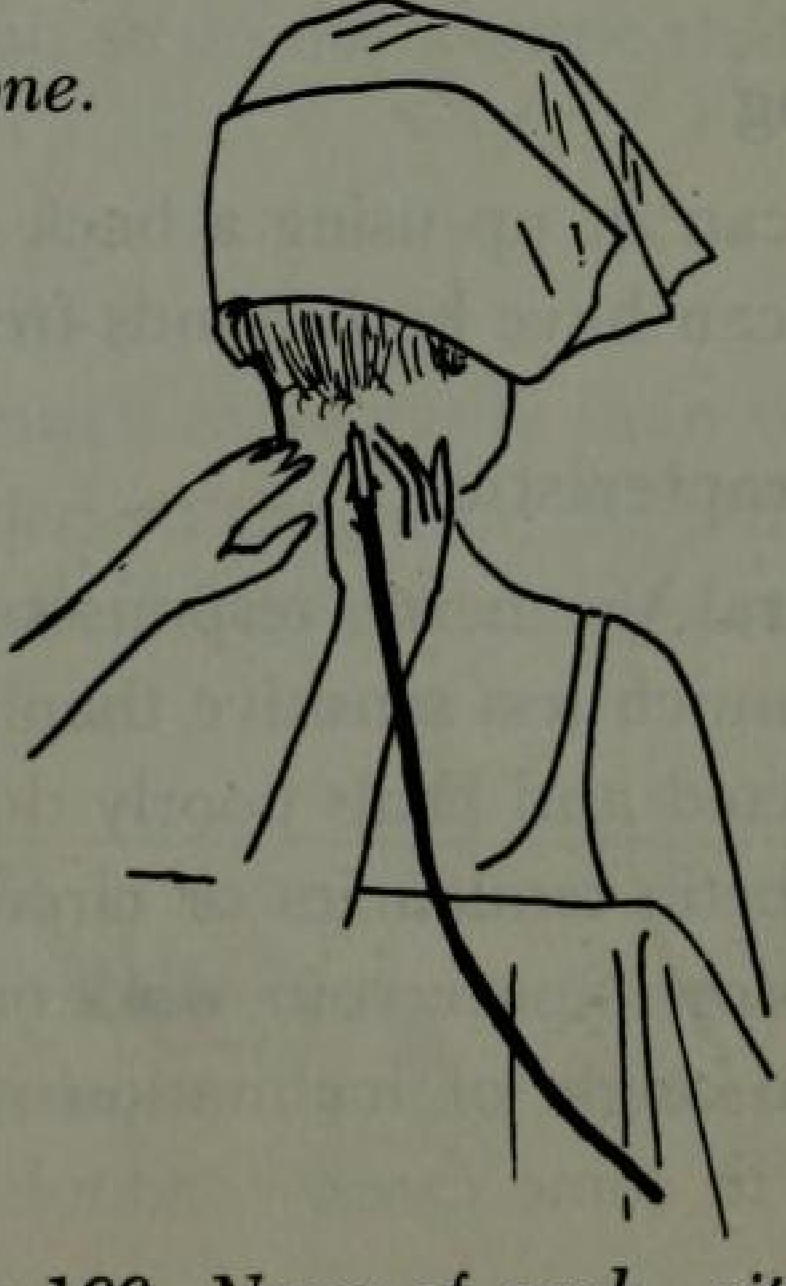


FIGURE 166. *Nape of neck—sitting.*

Positioning

The back of the neck is very unpredictable as to direction of hair, so area should be examined *before* patron is positioned. Depending on which side of neck is to be treated and direction of hair growth, patron may be either sitting up in a chair or lying prone on stomach; patron's head may be either to the right or left end of the table.

Area Characteristics

The back of the neck is insensitive to such a degree that epidermis breakdown can occur even though pain sensation is mild.

The epidermis is very thick and a deeper than usual insertion is required. The hair is usually not as coarse as chin bristles, so a long small-diameter (.003) needle is required.

A mixture of hair types from lanugo to heavy terminal will be found in the fringe area in single to triple patterns. Since tweezing is seldom done by the patron in this area, hairs will be in all stages of anagen, catagen and telogen.

Pre-Treatment

While patron is in standing position, determine area of hair to be removed and mark it with an eyebrow pencil or special skin pencil. To keep a natural appearing line plan the work in such a way that an irregular effect is produced. See Fig. 167.

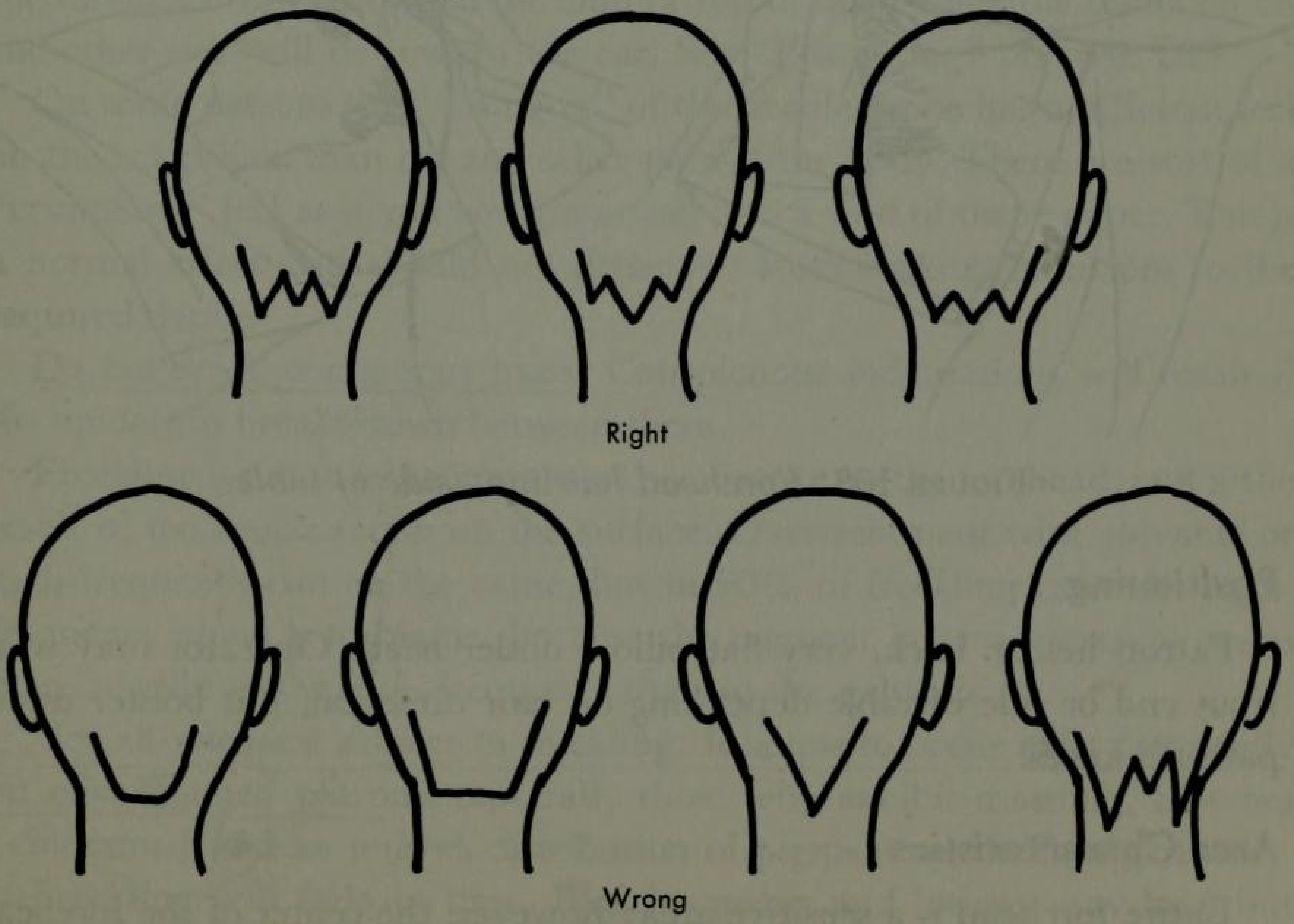


FIGURE 167. *Shaping the neckline.*

Suggested Technic

Use face technic for deep coarse hair. Because of deep insertion, high-frequency intensity control will be set somewhat higher than for chin bristles. Space work out on the first treatment. Olive skins may lose pigmentation on overtreatment so be careful not to make obvious designs. Body technic may be used if hair is of shallow terminal type that covers entire base of neck as well as shoulders.

Post Treatment

Cataphorese at all times. Apply usual after-treatment medicaments. If patron has tendency to pustules, use medicament containing an antibiotic.

Home Care Instructions

Do not shampoo, bleach or dye hair for at least 48 hours. If any lymph crusts should form they must not be picked off. Suggest usual home care medicament and procedures. Protect area from clothing with white washable scarf.

Forehead Hairline

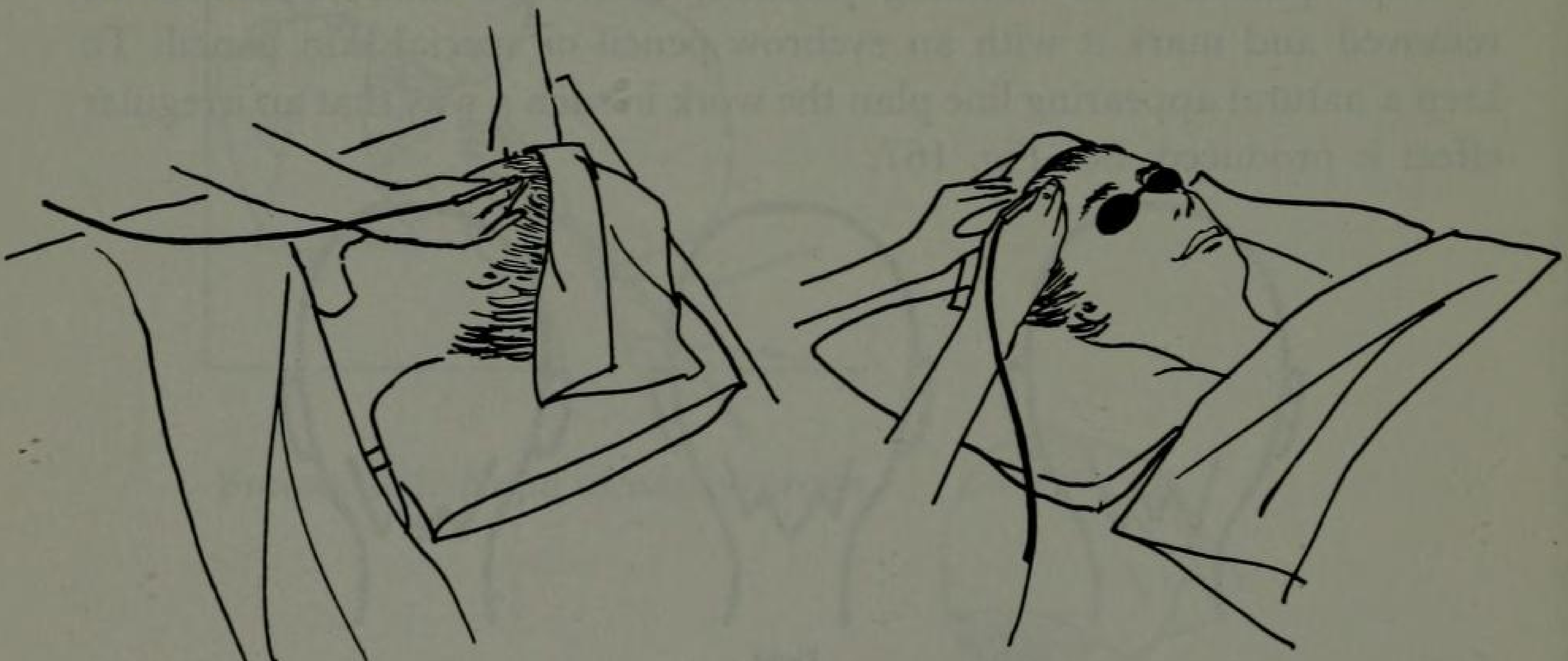


FIGURE 168. *Forehead hairline—side of table.*

Positioning

Patron lies on back, very flat pillow under head. Operator may work from end or side of table depending on hair direction. Put bolster under patron's knees.

Area Characteristics

Entire forehead is a sensitive area: however, the center of the forehead is the most sensitive. Premature testing of the hair for looseness during

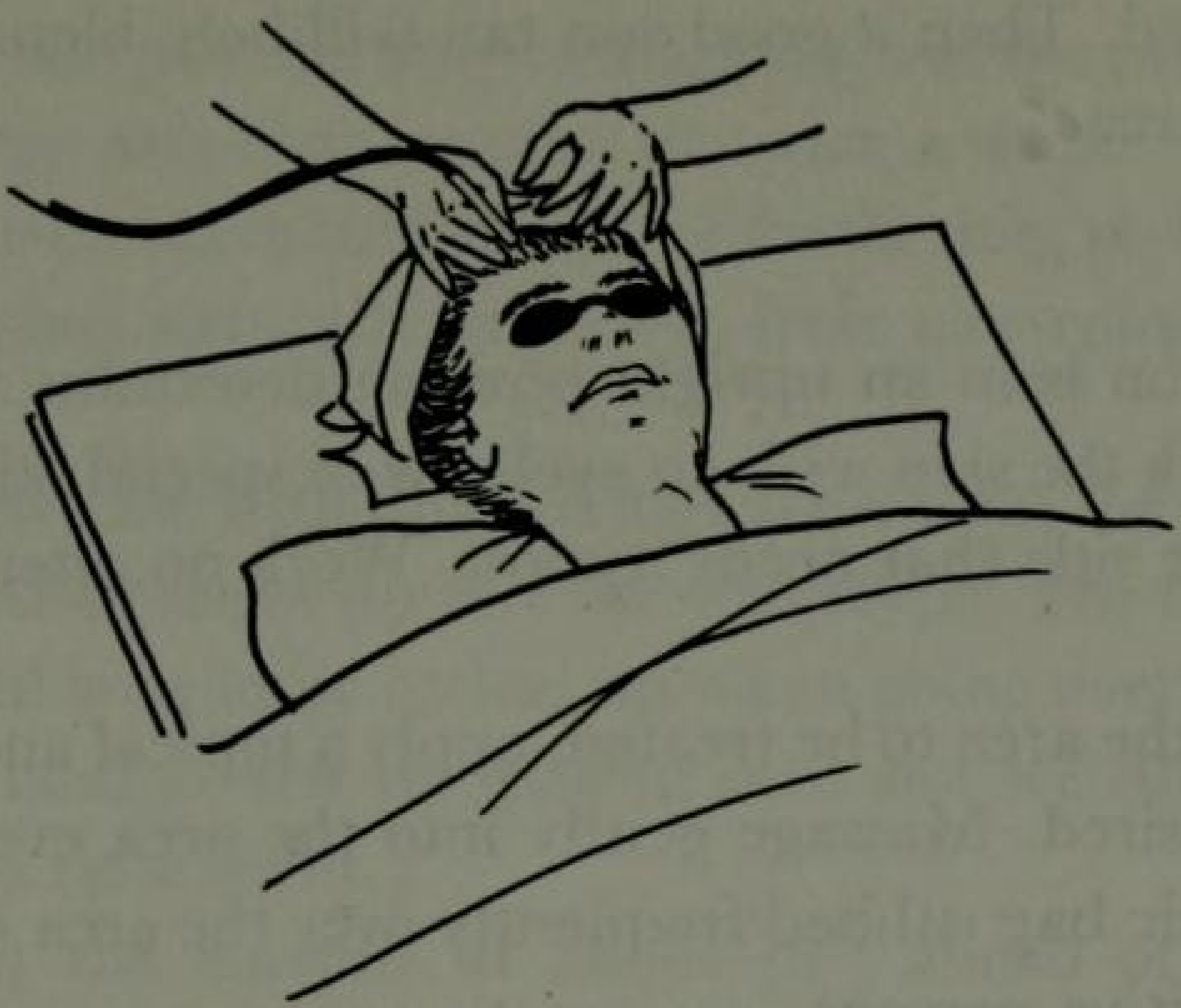


FIGURE 169. *Forehead hairline—end of table.*

treatment is often painful. (If using progressive epilation technic do not test for hair's release until one-half of the epilation time has elapsed.)

Hair diameter and length varies from long terminal scalp hair, to short (1″ to 3″) pigmented terminal hair, to lanugo hair. Those hairs that are other than scalp type hair we shall call "fringe" hairs. These fringe hairs produce an untidy appearance, and are usually the ones to be removed. Many cases require scalp hair removal along with fringe hair to produce the desired effect.

The angle and direction of hair in this region are quite varied. In a surprising number of cases, however, the hair direction on one side of the forehead will be toward the chin or top of head while the direction on the other side will be toward the ear. See "Feathering" on page 283.

On some patrons the "sliding in" of the needle probe has a different feel on the scalp hair than on any other part of the body. There is a sort of a "crunching" feel as if you were inserting into a wad of tissue paper. This is a normal effect and should not deter you from making insertions to the required depth.

Do not work contiguous hairs. Conspicuous indentations will result if the epidermis breaks down between them.

Freckling is not too uncommon an occurrence on the forehead, and is the result of too much action on the surface. Overtreatment with galvanic or high-frequency can be the cause, but in 90% of freckling cases the high-frequency alone is to blame, because the pigment layer apparently reacts more readily to the high-frequency than to the galvanic.

Not all skins are subject to freckling. It seems to occur most frequently on olive-skinned patrons, especially those who exhibit mottling, blotches (chloasma) and an uneven distribution of pigment on the face generally.

Freckling will fade in time. Bleach creams and lotions may help but must not be used unless skin has healed. Suggest cover-up make-up until the work is finished. Then a good sun tan will help blend the freckles into the surrounding area.

Pre-Treatment

While the patron is in an upright position determine area of hair to be removed and mark the skin with an eyebrow or special skin pencil. Remove hair first from the side that needs it most. Work on alternate sides so that effect is balanced.

After marking the area to be treated, apply a topical anesthesia, liniment or analgesic if desired. Massage gently into the area every half hour. An ice cube in a plastic bag rubbed frequently over the area is often very effective on extra-sensitive persons.

Suggested Technic

Use standard face technic and *do not expect* epilation speed faster than 10 seconds on scalp type hair; 15 seconds is the average with the low high-frequency technic.

Most hairline problems are expressed by the patron in terms of "raising the line" and invariably they point to the center of their forehead. Very often the height of the line in the center is ample, and to raise the center any higher would be a mistake. What the patron really wants, is to see more skin above her eyebrows. This is accomplished by removing the hair in a pattern as shown in Fig. 170.

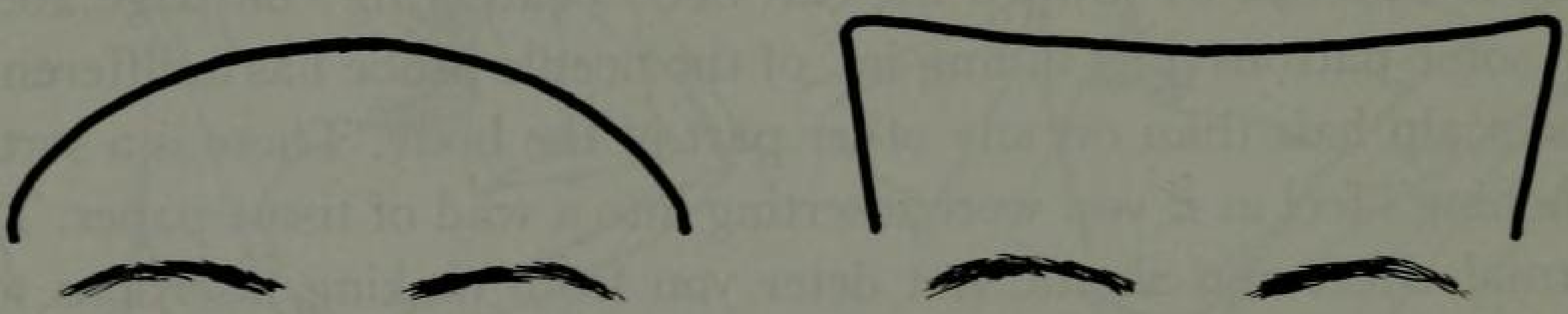


FIGURE 170. *Before and After.*

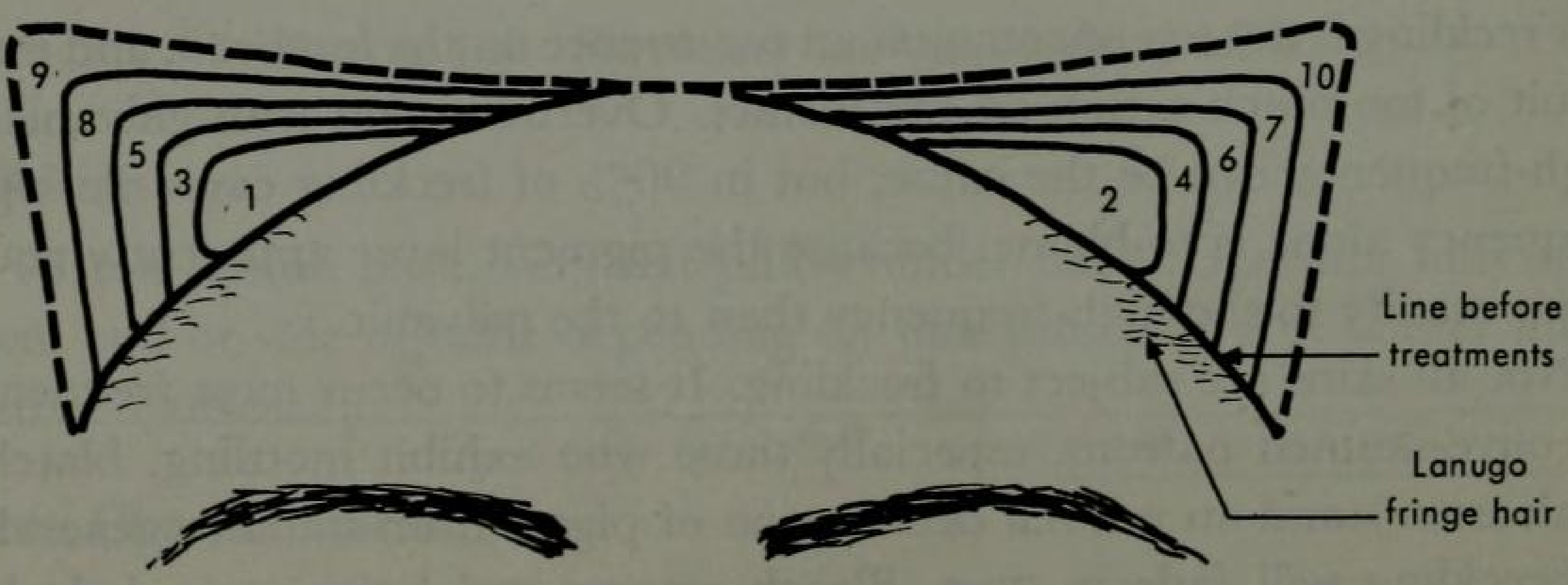


FIGURE 171. *Typical treatment sequence.*

Fig. 171 shows one possible way of mapping out the progression of treatments in an average case if given once or twice a week.

Subsequent treatments should consist of feathering, picking up reappearing hair that had shed naturally, regrowth from electrology treatments and lanugo fringe.

In starting a new case with much fringe hair, treat the intermediate hair (½″ to 1″) first, then move up into the scalp type. The fine lanugo can be clipped or left until later to be picked up when going over for regrowth. (If you work on the lanugo first the patron does not see sufficient change in appearance for the time spent.)

Stop advancing the hairline at about ¼″ ahead of where you plan to stop, then begin to feather. See "Feathering" below.

Post Treatment

Cataphorese at all times. Apply usual after-treatment medicaments. If patron has tendency to pustules, use a medicament containing an antibiotic.

Home Care Instructions

Do not shampoo, bleach or dye hair for at least 48 hours. If any lymph crusts should form they must not be picked off.

Suggest usual home care medicaments and procedures.

Feathering for Natural Looking Hairlines

The patron with an uneven or undesirable hairline presents to the electrologist a challenge which has many facets. Not only must she help the patron decide on a hairline style to suit her face type, but she must accomplish the task with unnoticeable treatments that terminate in a natural-appearing complimentary effect.

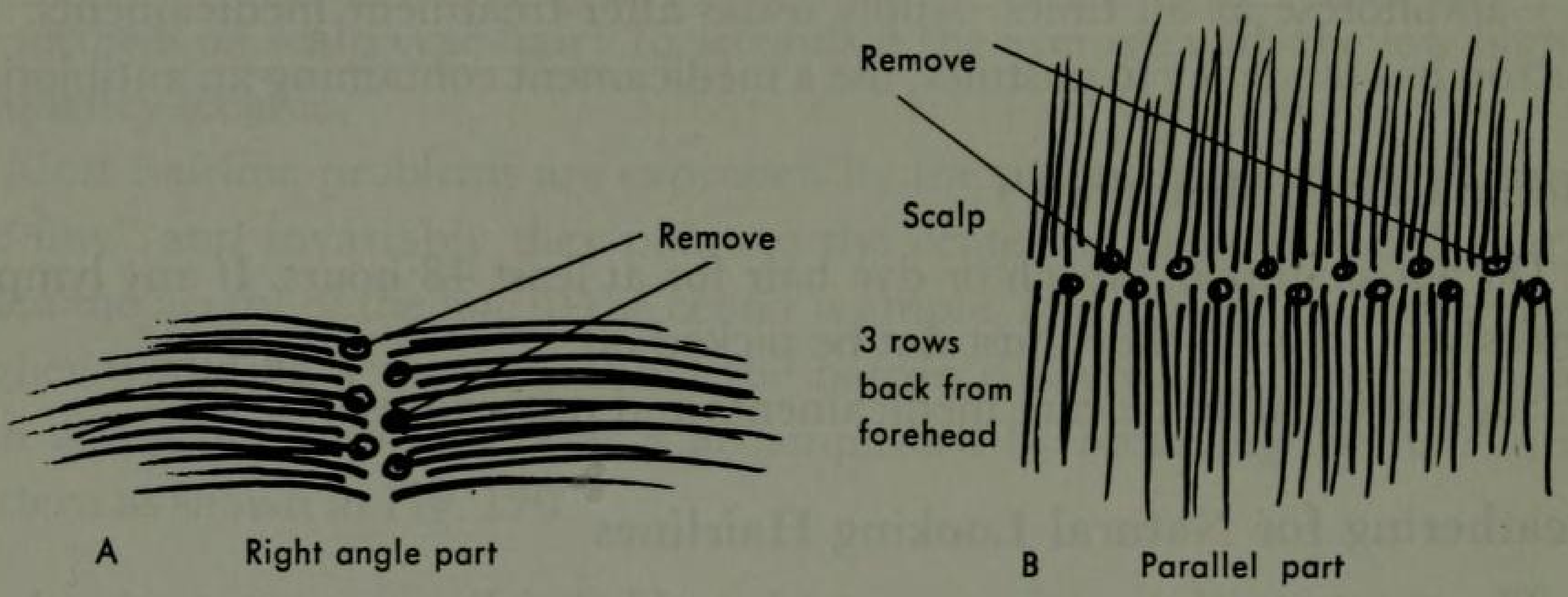
It is not within the scope of this book to explore specific face types and corrective remedies needed to improve facial faults. These may vary with current styles. For tips on style the electrologist ought to avail herself of recent books on charm, poise and beauty which discuss things of this sort. In the present discussion we shall have to confine ourselves to the mechanics of doing the work proper, which will not change with time unless, of course, the shaved-head ever comes into vogue.

Hairline is an Illusion

A finished hairline should not look shaved or tweezed but should have a *natural thinned-out or "feathered" look.* Very often both patron and operator know that something does not look right about the "finished" line but cannot see what has gone wrong. In an attempt to remedy the line, the electrologist may remove a little more here and a little more there, but she soon finds she has made the line all too high and still not pleasing to the eye. Most likely the original unsatisfactory appearance had been due to a failure to feather the hairline.

The first thing the electrologist must realize is that magnification makes a hairline look different than it does to the unaided eye. The hairline should look natural from a distance of two or three feet. At this distance the line which is apparent to the naked eye is really a blended outline which gradually increases in density to the point where the skin is no longer visible. This may be ¼″ to 1″ beyond the first line of hairs that are observed under magnification. The fact that the hairline is an illusion must be constantly kept in mind when working in this area.

The problem of magnification can be overcome by the simple trick of parting the hair and treating follicles staggered and spaced along either side of the part. See Fig. 172.



A Right angle part

B Parallel part

FIGURE 172. *Parting the hair for feathering.*

The hairs selected for treatment should be the coarsest and largest in diameter. Since only the coarse hair is removed, the remaining fine hair lends a natural look to the finished effect.

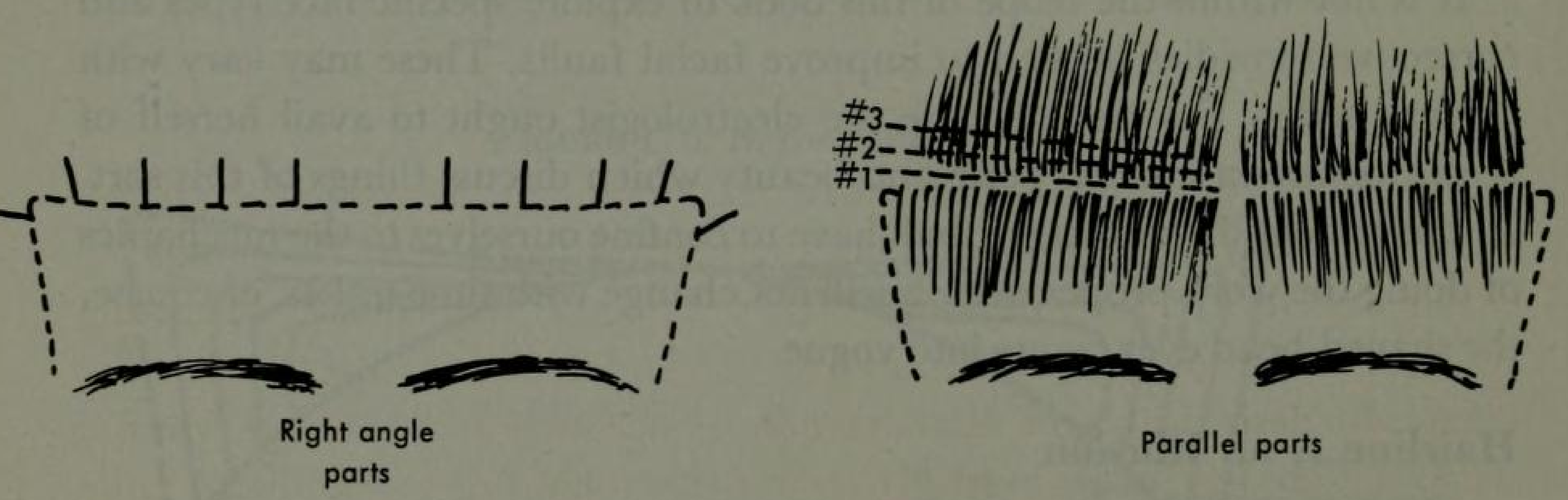


FIGURE 173. *Spacing the feathering parts.*

In Fig. 173 it can be seen that the right angle parts are made every ¼″ to ½″ along the hairline depending upon where the thinning out is needed. If desired, parallel parts can be utilized instead of, or in conjunction with, right angle parts. When using the parallel part method make the first part about ⅛″ back from the leading edge and after treating follicles along the line of the part, make another parallel part ⅛″ back of the first. Repeat for a third or fourth time depending on the density of the hair, and the effect you wish to achieve.

If, after feathering, the patron feels the need of raising the line even more, then proceed, by completely removing the front ⅛″ line of hair and then feather back further to make up for what was taken from the front. In this way when you reach the finished line it will be feathered and natural looking. It is unbelievable what an hour spent in feathering can accomplish toward the creation of a higher-appearing forehead hairline.

Hairline Corners

Creating a natural corner is accomplished by letting it form itself, so to speak. The electrologist must not try to produce a square or rounded shape but rather feather out the corner to produce an indefinite outline, that is, neither square nor rounded.

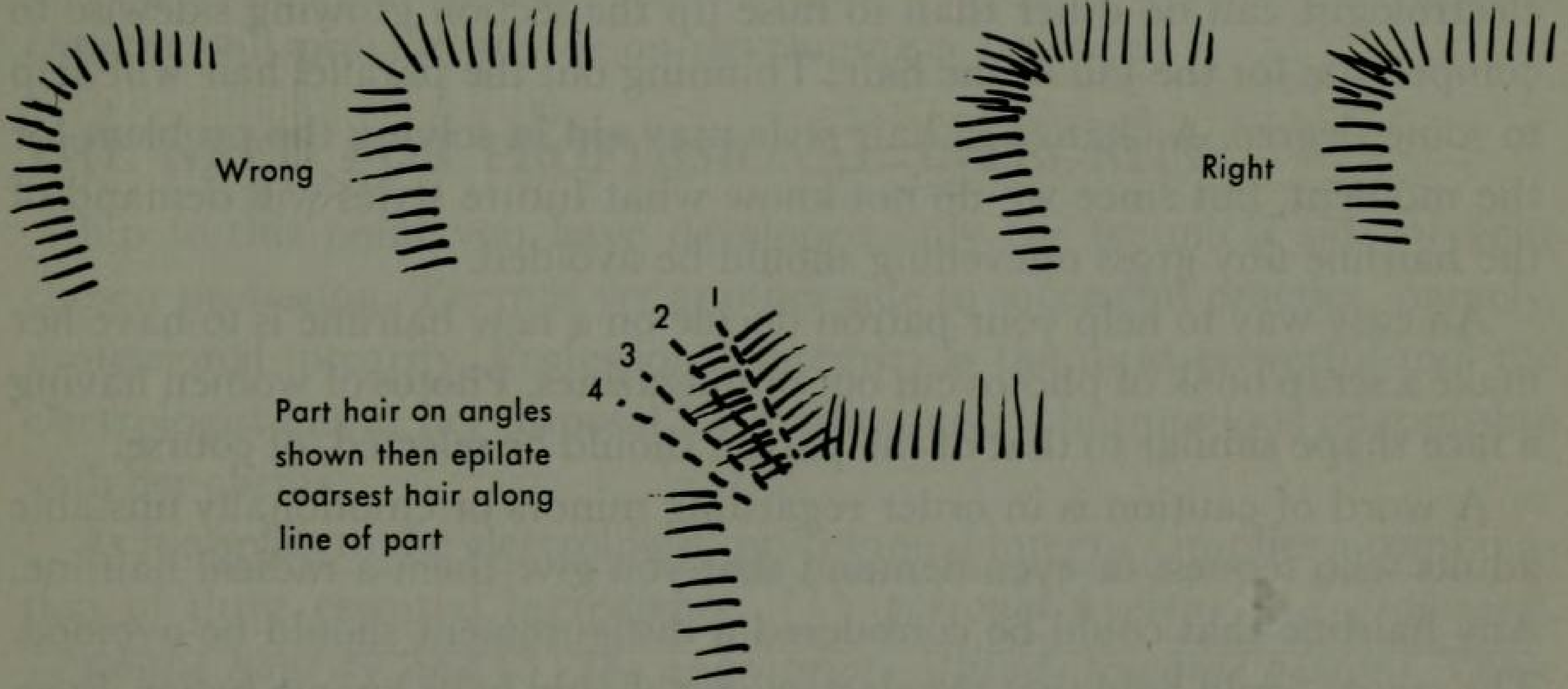

Wrong
Right
2
1
3
4
Part hair on angles shown then epilate coarsest hair along line of part

FIGURE 174. *Feathering a corner.*

First proceed by working on the horizontal line up to within ½″ to ¼″ from the corner. Then work along the vertical hairline by the temple to within ½″ to ¼″ from the same corner. The next step consists of parting the hair in the corner as shown in Fig. 174 and feathering the hair back to create the desired illusion. Remove hair along the line of the part. Do not try to match the corners perfectly as no natural hairline is exactly the same on both sides.

The Two-direction Hairline

A large number of patrons with forehead hairline problems have a hair direction that varies from one side to the other. The right side may grow straight back or forward while the other side may grow sideways toward

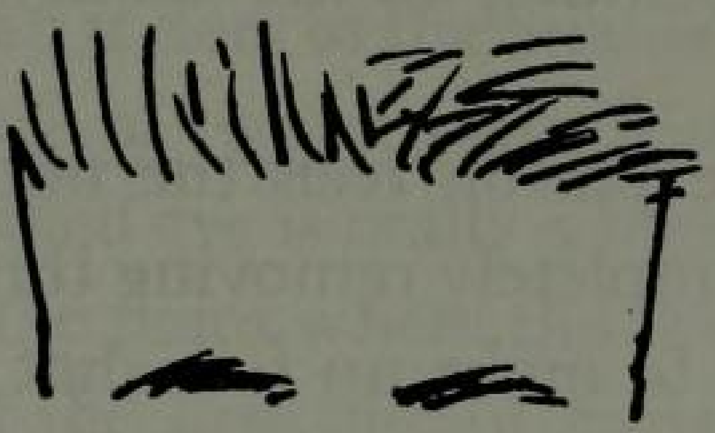


FIGURE 175. *The two-direction hairline.*

the ear. See Fig. 175. Feathering on the line that grows sideways will not be apparent because the hair falls over the feathering. If you comb the hair back and work both sides evenly with the patron on the table, the line will appear uneven when the patron stands up and her hair assumes its natural angle.

This problem must be explained to the patron since there is very little the electrologist can do other than to raise up the section growing sidewise to compensate for the fall of the hair. Thinning out the parallel hair will help to some degree. A change in hair style may aid in solving the problem for the moment, but since we do not know what future styles will demand of the hairline any gross unevening should be avoided.

An easy way to help your patron decide on a new hairline is to have her make a scrap book of photos cut out of magazines. Photos of women having a face shape similar to that of the patron should be selected, of course.

A word of caution is in order regarding minors or emotionally unstable adults who request or even demand that you give them a radical hairline. Any hairline that could be considered a disfigurement should be avoided. The courts could hold that the electrologist should have known better. Even a written release would be of doubtful value, since the patron herself may be held unresponsible.

Chapter XIV

Developing a Practice

Now you have "had the course," and here you sit, epilator in hand, and no place to go. Just what business opportunities await you? Where should you work? With whom, if anyone, should you associate? How should you conduct yourself? These and similar questions must be answered before any of your recently-gained skills can be put to use. To this end, the present chapter will provide advice on developing a practice.

THE NEED FOR PROFESSIONAL INTEGRITY

Up to this point you have developed only the technical side of your chosen profession. There is yet another side to successful practice, namely, professional integrity. Professional integrity is the most powerful tool the electrologist has at her disposal for maintaining a harmonious relationship with her clients.

As it applies to the electrologist, professional integrity implies a combination of three essential ingredients: (1) *personal hygiene and grooming,* (2) *basic honesty, and* (3) *the appropriate attitude towards patrons.* These qualities are obviously desirable in their own right, but in addition they serve to enhance your "professional projection." That is, they go to make up the image which the public has of you and your practice, and this image, this professional projection, is in large part what the public believes it is buying. Electrologists trained to perfection in the technical skills are frequently unsuccessful in practice because of their inability to project themselves professionally. Professional projection in our field cannot be created simply out of advertising and promotion; the patron-electrologist relationship is too intimate for that. Professional projection in electrology results only from professional integrity, the development of which requires earnest, thoughtful effort.

Personal Hygiene and Grooming

Care for one's physical health and appearance is perhaps the easiest to acquire of the three ingredients of professional integrity, since it merely involves the development of simple daily habits. Besides the normal routines of well-balanced meals, proper rest and sunshine, which everyone ought to observe, the electrologist should, in addition, give particular attention to the following rules of personal cleanliness:

(a) Keep the body immaculate and free from odors.

(b) Maintain clean and properly manicured hands and nails. Extremely long fingernails are out, since they are not only unsanitary and unbecoming, but also interfere with work and feel uncomfortable to the patron.

(c) Keep hair carefully combed and tastefully styled.

(d) Make sure that your face is always clean and properly made up, avoiding excessive make-up.

Clothing must also be neat, clean and properly fitted to convey a well-groomed appearance. Always wear a uniform rather than street clothing, since a good portion of your "professional projection" as an electrologist involves personal appearance. The electrologist, due to the nature of her work, should dress more like those in the medical profession than those in the cosmetology field. For this same reason, dangling earrings, bracelets and large stone rings should not be worn, and high-heeled shoes are inappropriate.

Honesty

No one can have dignity—professional, personal or otherwise—unless she is basically honest. If an electrologist misrepresents her abilities to remove hair permanently, she is bound to end up failing to perform as expected, thus losing both her client and her own self-respect. Experience has shown that ethical practices are, in the long run, the most prosperous. In a field where electrologist and patron are required to work in close cooperation over periods of months, even years, only a relationship of mutual trust is bound to succeed.

Professional Attitude

Acquiring the proper professional attitude is the most difficult phase of building integrity as an electrologist. The difficulty consists primarily in identifying with the unique role of the electrologist. For the electrologist is neither doctor nor cosmetologist, even though her field encompasses aspects of both of these professions. Since electrology deals in a certain amount of pain and necessitates the use of medication, it has some semblance of the medical profession. But, as has been observed in Chapter

One, the purpose of electrology is essentially a cosmetic one. For these reasons, neither a wholly medical orientation nor a wholly cosmetological one will fulfill the special demands of electrology.

The most successful electrologists have one element in common, a kind of maternal firmness which one would expect of a dedicated nurse. Courtesy and neatness are part and parcel of this quality. The ideal electrologist has a certain pleasant way of understanding the patron, which gives the patron confidence in her abilities. The key factor in her attitude is *concern.* It is important to develop concern for every aspect of your practice. This will make you more efficient, increasing the patron's trust in you.

Your concern for the patron's hair problem should, perhaps, be greater than her own. When a patron calls and advises that she is unable to keep an appointment, show her that you feel she should try to keep up with her schedule so that you can quickly solve her hair problem. In this way she will come to think of the progress of your work as far more important than, say, keeping appointments at the beauty shop.

Even concern has its limits, however. The electrologist and her patron often develop a close bond of friendship over the months. But when it comes to discussing family or personal problems, change the subject. What the patron may divulge to you may be cause for later embarrassment. It is not uncommon for a patron to fail to return for later appointments because she told the electrologist personal things that she later regrets. Above all, never offer personal advice and never divulge a confidence.

When you have succeeded in developing the elements of personal hygiene and grooming, basic honesty and the proper professional attitude, you will have acquired professional integrity. Taken together, professional integrity and technical skill are the "tools of your trade."

SETTING UP SHOP

There are, of course, no strict rules of conduct to guide the electrologist to inevitable happiness and fulfillment in her profession. Some electrologists succeed under the most adverse business conditions while others fail under seemingly ideal circumstances. Such apparent paradoxes are largely due to integrity factors such as those discussed above. But, with few exceptions, success as an electrologist is unattainable without a careful application of certain business principles.

Your author, A. R. Hinkel, through his close personal contact with a large number of former students, has been able to observe the success and failure of a wide variety of business methods among electrologists. From these observations, several general rules have been formulated to help the student avoid the ordinary pitfalls of business practices.

The beginning electrologist must decide, first of all, whether her personality and financial position really suit her for self-employment. To operate a successful office on her own, an electrologist must be independently minded. She must also be able to keep accurate records. And she ought to possess some degree of salesmanship, since she will have to "sell" her service. Lastly, she must have sufficient financial resources to cover equipment, rent and living expenses for at least the first year of practice, while developing her clientele. As an employee, an electrologist would not have to bother with any of the problems of setting up shop. But, as self-employed, she must make many decisions concerning location, leases, promotion and the like.

What Neighborhood Is Best?

The first decision facing the potentially self-employed electrologist is location. Where should she hang up her shingle? In selecting a neighborhood, she ought to consider the following factors:

(1) Affluence of the local people.
(2) Racial backgrounds of the people (genetic hair problems).
(3) General interests and living habits of the people.
(4) Transportation accessibility and parking facilities.
(5) Foot traffic past your shop (if a factor).
(6) Advertising media at your disposal.
(7) Other established electrologists in the area.

No location is likely to be without some disadvantages. One should try to determine how severely the disadvantages will affect business. For example, if all factors are ideal, save that the local people have little money, the location would be a poor one. Or if local people are sufficiently well off but belong predominantly to a race that have few hair problems or are a kind of people who take little pride in personal appearance, then this too would be a poor location.

What Kind of Office Is Best?

The neighborhood is not the only consideration in locating an office. The nature of the premises is also extremely important. What one chooses will be, to a large extent, a matter of personal preference. Some prefer a prestige location with higher rents while others would rather have a less ostentatious office and a greater profit margin. Again, some like the noise and activity of a beauty salon while others would rather have the quietness of a private office.

To enable the student to select those office arrangements most compatible with her own circumstances, we shall survey briefly the variety of arrangements available to the electrologist. Electrologists' locations have varied from private offices in plush medical buildings to converted spare rooms in their homes and from unmarked rooms high in an office building to street level shops with an "Electrolysis" sign twenty-five feet wide. But these represent the extreme. Listed below are ten of the most common office arrangements found among practicing electrologists:

1. Private office in professional building.
2. Small store in arcade or shopping complex.
3. Office in medical or dental group sharing common reception room.
4. Booth or room within a beauty salon.
5. Concession within a department store.
6. Space in cosmetic shop or wiggery.
7. Space in slenderizing salons.
8. Space in health clubs.
9. Office space in conjunction with medical doctors, optometrists, podiatrists and other professionals.
10. Office in a home that meets all state and city requirements as a licensed business.

Your author has made no attempt to itemize the above locations in terms of their desirability. In the final analysis, the profitability of any office arrangement hinges on the electrologist's effort to utilize the office's peculiar advantages. There are, however, certain general advantages and disadvantages attached to each of the above types of office arrangements which can be briefly mentioned. Let us take them up in their listed order.

(1) The private office in a professional or commercial building has the advantages of privacy, independence and limitless space. Its principal drawback is the fact that its location is inconspicuous. More than a year will be required for promoting business, since there is no way for people to discover your practice without an investment of money, effort and time on your part. Doctors, friends and social contacts are the only alternatives to hard cash in promoting the private office.

(2) The small store in an arcade or shopping complex requires a higher expenditure to set-up than does the private office. In addition, rents tend to be higher. These higher rents are often offset, however, by the increased business stimulated through modest signs or other forms of advertising, strategically located in your window.

Modesty is a vital factor in any public location. Patrons are often hesitant to pass through a street door that declares to the world that they have a hair problem. For this reason it is perhaps best that the shop not be in plain view of the street. Although the "shame" of a hair problem is something we should strive to overcome, we must at the same time recognize that it is a very real consideration in setting up shop.

One clever way to help patrons avoid embarrassment is to allow a subtenant to sell cosmetics or some other product compatible with electrology in the front area of the shop, thereby providing the patron with another apparent reason for entering your door. This method also brings the sub-tenant's customers in contact with your practice, and the sub-tenant helps to defray rental expenses.

(3–9) Situations 3 through 9 in our list have one advantage in common. In each of these cases association with other business operations exposes your practice to a steady flow of people, heavy or light, depending on the size and type of business. In addition, those people with whom you associate will tend to spread word of your practice. Thus the public will become aware of your service at little or no cost in advertising. Naturally, any promotion or advertising you can afford will speed up the development of your clientele.

(10) An office as part of your home has an obvious rental advantage. But the great disadvantage to this setup is that such an office eventually ceases to be a home. Patrons knowing you are home will arrive or phone for treatments at any hour of the day. The advantages and disadvantages of this type of location are actually too great to be discussed comprehensively. However, the beginning electrologist should be aware that to establish a business at home she must, in many states, not only fulfill city requirements but state requirements as well. Often state public health and safety laws must be observed as well as city zoning and licensing laws. Before you embark on a home-office operation, it is imperative that you check with state and local authorities.

What Rental Situations Are Available?

In renting or leasing office space in which to practice, the electrologist will encounter one of two situations. Either she will rent or lease space from a building owner and thereby become the tenant or lessee or else she will obtain space within a doctor's office or beauty shop or other type of business, in which case she becomes a sub-tenant.

The direct renting or leasing of commercial space, as in a store or office building, is the least complicated arrangement because the problem is merely one of finding suitable space of such size as to meet your needs and your budget. The rental cost of commercial space is usually based on square footage.

Often times the problem confronting an electrologist seeking commercial space is one of too much square footage. Two hundred square feet (two 10 x 10 rooms) is ample space for a reception room and a single treatment room, but it is difficult to find commercial building space that small. If a larger space must be rented, a second treatment room or dressing cubical or private consultation office may be added.

The rental of commercial space has several advantages worth considering. If you decide to lease for several years you are assured of a fixed rent for that time. If you wish to sell your business, the lease makes it more saleable. On the other hand, leasing involves the disadvantage of having to stay situated at the same location for the duration of the lease. With any private office there is the additional problem of communication. With no one to answer the phone in your absence a telephone exchange or telephone extension to your home is very necessary. This creates additional expense.

The alternative to being a direct tenant is to become a sub-tenant of someone else, such as a doctor or beauty salon or other business. The rental of space in this case becomes rather complex because the cost is not based on square footage but upon a number of other factors. Here are some typical points of conflict: Can they spare the space? Is electrology compatible with their business? Do their business hours agree with yours? (If they close at 5:00 P.M. how do you handle evening appointments?) Will they take your phone calls in your absence? Will they allow a sign in their window? May you have a key to the premises?

When associating with a doctor a further point to consider is, on what basis will the doctor have you as a sub-tenant? The doctor may wish to have the electrologist assist him by giving ultra-violet or diathermy treatments or by acting as part time receptionist. The doctor may also desire the electrologist to be part of his office group so that services rendered by you at his office would meet the requirements of certain government subsidized medical programs.

If you desire to sub-let space in a beauty salon or other business, there is another set of factors to be considered. In the beauty salon, for instance, an electrology booth takes up the space of two stations used by cosmetologists. A small, busy salon cannot afford to give up space for the income it would receive from the electrologist. If however, the salon has an unprofitable facial booth as well as a few unused stations, the income from the electrologist may be quite welcome. The question is, what will the salon have to gain by having an electrologist on the premises? Will your patrons help their business? Is an "all-beauty-services" type of operation desirable?

There are many aspects for the electrologist to consider before becoming associated with a beauty salon. For example, one of the most important factors is the organization of the shop. Is it run under energetic progressive management or is it "dying on the vine," with warring factions of employees overpowering weak management? The latter type of salon may prove commercially successful, if other conditions such as location, rent, etc. are favorable, but it would not be a pleasant place to spend one's working hours.

As you can see, setting up a business as a sub-tenant has many facets. The rent or percentage of the gross you pay or any other working arrangement decided upon depends to a great extent on which of the parties involved—the electrologist or the lessor—initiates negotiations. The balance of bargaining power seldom tips in favor of the one "wanting in."

How Much Space Is Required?

Whether you are to become a tenant or a sub-tenant the amount of space you need, want, or have to contend with soon enters the picture. The minimum treatment area that an electrologist can squeeze into is 6 x 8 feet. Since the table is six feet long, it is obvious that the eight foot dimension allows only a two foot clearance from the table end. A space this small should not be considered unless other factors such as "big name" salon or prime location make the cramped quarters worth enduring. Spaces of 8 x 8 feet or 7 x 10 feet are much more desirable since a small desk and a comfortable chair can be added to the basic equipment.

In addition to the treatment area, there must also be a reception area. The reception area of a beauty salon, medical office or other similar business will accommodate your waiting patrons without need for renting further space. Your own shop or office would have to include additional space for this purpose. If ample space is available, a private consultation room or office, a waiting room and a dressing room might be added. If business warrants it, a second treatment room for an assistant may be considered.

What Equipment Is Needed?

The following list of equipment and furnishings is of use to the average electrologist: Epilator and accessories, needles, tweezers, treatment table and step stool or treatment chair, light source, adjustable height stool, cotton, germicides, medicaments, covered trays, jars, utility stand or cabinet, covered waste receptacle, storage cabinet with doors for linen and supply storage, towels, wash basin with hot and cold running water, desk or table for telephone and appointment book, wall charts of the hair follicle and an F.M. radio.

If you intend to have a dressing cubicle, further equipment is required: Mirror with shelf or dressing table, chair or padded bench, adequate lighting, coat hooks and washable gowns if desired.

Always have a mirror for your patrons' use in some area other than the treatment room. This saves time between patrons. A dressing table or a wall mirror with a shelf beneath it is quite practical.

It is obvious that the above list includes only the bare necessities. Drapes, carpeting and crystal chandeliers can be added if desired but, please, no string ensemble at 2:00 P.M. in the foyer.

Promoting the Business

Once the physical facilities for your practice have been installed, it remains for you to find clients. The electrologist has, generally speaking, three means of business promotion open to her: (a) social contacts, (b) advertisements and (c) telephone consultations. While personal contacts and advertising serve primarily to arouse public interest in your services, it is usually the telephone consultation that convinces a person to utilize them. The establishment of any new practice depends to a large extent on the kind of public image created through these promotional technics.

Professional integrity is the key ingredient in successful promotion. Truth and honesty are old-fashioned words that seem to be gradually disappearing from our vocabulary (some codes of ethics even fail to mention them), but unless the electrologist deals truthfully and honestly with her patrons she will not be able to develop sound customer relationships.

If an electrologist makes such promises as "painless," "no regrowth" or "1,500 hairs removed per hour," she will have to defend them when the patron experiences conditions to the contrary. As soon as the patron feels the action of the current on the first hair, she will realize it is not painless; it may not be excruciating, but it is certainly not painless. The patron's first thought is that she has been deceived. She will probably reason, "This electrologist said the treatment was painless but it hurts. She did not take out fifty hairs in the last two minutes either. She also said that the method was permanent. Maybe that is a lie too. Perhaps I am simply wasting my money having this work done." Few patrons would return after such a let-down.

(a) Promoting through social contacts.

There is little specific advice that can be offered on methods to stimulate business through social contacts other than to say, very generally, be friendly and active. Membership in social clubs, churches, business groups and other organizations will help you spread the word. Acquaintance with people in related fields such as doctors, dermatologists and cosmetologists will bring in a number of referral cases. And merely getting to know the people in your immediate commercial community is helpful. The way to conduct yourself in any social context will depend on your own personality. Above all, be yourself.

(b) Advertising.

In setting up an advertising program, the electrologist must make many practical decisions concerning the kind of media to use, the size of ads to run and how often to run them. The solution to many of these problems can be obtained only by trial and error. It is best, however, not to expect just one big splurge of advertising to do the trick. Modest and consistent advertising seems to be more productive for the average electrologist. After two or three years of practice, recommendations from past patrons will help to a considerable degree in bringing in new patrons. No further advertising will be necessary except for the "Yellow Pages."

Your advertising should take into consideration the fact that electrology is somewhat of a seasonable business, with spring and early summer being the better time of the year in most parts of the country. March usually marks the beginning of the up trend, while June and July are the peak months of the year. December starts the down cycle with January and February being the lowest months of the year. When an electrologist has been established for several years, her income will not vary too greatly between the highest and lowest months of the year. Usually it is just in the beginning years that the electrologist will experience large seasonal variations in income. However, excessive advertising of any type during the normally poor months would be just a waste of money. A prospective patron who has been tweezing for ten years sees no urgency to start treatments during the year-end holidays.

A word about the effect and value of newspaper display ads versus classified advertising may be apropos at this point. Display ads are the type you find interspersed among the columns of general news items. Because the reader is not looking for your ad she discovers it accidentally while reading the news. Classified ads, on the other hand, appear in the section of the newspaper which is read by people seeking a specific service or commodity.

Classified newspaper advertising is of questionable value. If, on the one hand, you should advertise in appropriate categories such as "beauty aids," you may be needlessly duplicating the listing you have placed in the Yellow Pages of the telephone directory. For if the reader is sufficiently informed to know that permanent hair removal by electrolysis exists, she is most apt to check under the proper heading in the Yellow Pages.

If, on the other hand, you should place an ad in some other category of the classified section, such as "personals," you may find your ad associated with messages of dubious character, purpose or honesty. Many big-city newspapers run notorious "personals" columns, which do nothing but degrade their subscribers. Scrupulously-run newspapers are, of course, perfectly all right.

Display ads are the most likely means of bringing new clients through the newspaper. Kept simple and in good taste they are an invaluable aid to promoting a business. The wording of ads should be carefully planned. Be careful not to insult your prospective patron. Do not brand her as "unsightly" or "ugly," but rather make positive suggestions such as "be lovelier." Beauty is always more marketable than ugliness.

For "high style" media, as well as newspaper sections, advertising should concentrate on hair removal from eyebrows, hairlines, underarms or legs, rather than areas where hair is associated with a masculine appearance. Removing hair from the first-mentioned areas is socially acceptable and less repugnant to the reader. As the public becomes better informed about glandular problems, the embarrassment factor that plagues the field will gradually disappear. The electrologist can encourage this trend by utilizing well written advertising that "plays down" the stigma of masculinity.

Promoting a business in a professional way necessitates the elimination of advertising technics that are in poor taste, such as "before" and "after" photographs, testimonials and screaming superlatives. Mention of price, too, should be avoided in advertising. Not only is this professionally taboo; it also tends to create a "price war" situation which benetfits no one in the long run. Another undesirable practice, advertising that viciously discredits other electrologists or their methods, is not in the best interests of the field, nor does it succeed in attracting new patrons.

(c) Telephone consultation.

The majority of prospective patrons will telephone the electrologist before making a personal appearance, which means that the telephone interview is your most important means of business promotion. Many books have been written on the subject of telephone selling, but they offer little advice on how to offer services similar to electrology. The electrologist is not involved in soliciting. Because people call her for information, she must employ a special kind of persuasion.

Truth and honesty must still reign in the telephone interview, but the manner of delivery must be carefully timed and adroitly performed. For example, if a caller immediately asks, "How much . . . ?" and you blurt out, "Twenty dollars per hour," you will probably hear "Thanks" — — click. This kind of interview is over before it starts. It is important that the electrologist direct the telephone conversation in a way that lays the "ground work" for dealing with questions of time and cost. The questions you ask early in the conversation can win the caller's confidence as well as enable you to deal diplomatically with the inevitable inquiry about the cost. If, for example, you discover that the caller has a problem such as a lip growth, which requires only fifteen-minute treatments, quote the fifteen-minute price rather than the one-half hour or the hourly rate.

The purpose of the telephone interview is twofold: to develop a working knowledge of the caller's problem and to gain enough of the caller's confidence to encourage her to come in for a consultation. When a prospective patron phones, you should try to think of her as someone with whom you will be spending many hours. (You hope!) Since the patron will be entrusting you with an intimate problem, show sympathic interest. Let the patron tell you her story. Ask her questions about the location of the growth —face or body? If, for example, the growth is on the face, find out if it is on the lip, chin or sides. What is she doing to the hair now? If she is tweezing or waxing, comment on the futility of these methods. If she is shaving, express sympathy for her problem. When it seems appropriate, suggest a consultation to answer all of her questions, explaining that you are busy with patrons. When a patron enters your office after a telephone interview of this type, she will feel that she already knows you; you are not strangers.

Early in the telephone interview you should try to determine how the prospect found your phone number. Sometimes she tells you she saw your ad or that someone told her about you, perhaps a doctor or a friend. By determining how she located you, it is often possible to evaluate what she knows about the field. The direction of your discussion with the patron both over the phone and in the office consultation should be adjusted to meet her level of familiarity with electrology.

The majority of patrons find the electrologist in one of the three following ways: (1) through medical or personal referrals, (2) through advertising media in which other electrologists are not *directly* competing (e.g., display ads, radio commercials, street or window signs), (3) through advertising media in which other electrologists are directly competing (Yellow Pages, business directories). A "rule of thumb" has been developed for dealing with the varying degrees of information or knowledge possessed by the prospective patron from each of these categories.

First, the person referred to you by a doctor or a satisfied patron of yours requires very little selling or convincing. She is practically pre-sold. Just the setting up of an appointment time is necessary and perhaps a little advice not to tweeze or shave on the morning before coming in.

Second, the person who is responding to advertising media in which other electrologists are not shown, usually knows nothing of electrology and is surprised to hear that hair can be removed permanently. To this patron, the simplest of replies are needed to her questions—no technical talk. There is no need to discuss methods, currents or probes to this patron. Since she knows little or nothing about electrology, she must be assured of its effectiveness by reference to articles which have appeared in magazines in which she has confidence, such as "Good Housekeeping" or "Vogue." Reference to your being licensed by the state, if that is so, also reassures some prospects. Mentioning the endorsement of a doctor, if he will permit your use of his name as a reference, is most effective. After you have gotten a good grasp of the caller's problem, invite her to come in for a consultation or offer to send her literature that will convince her that electrology is effective.

A patron who responds to an ad but who has had previous electrology experience is not really in the second category just mentioned, but rather her degree of knowledge places her in the third and next category.

Third, the person who is responding to an ad in a medium that contains the advertising of other electrologists as well as your own, like the Yellow Pages, requires the most selling. This patron has been exposed to words like electrolysis, thermolysis, short wave, diathermy, as well as numerous brand and trade names. She has seen ads that indicate that hair is "removed by air," and others that claim thousands of hairs removed per hour. It is perhaps better to say that this patron is confused rather than knowledgeable, and it takes much time and patience to answer all of her questions.

If she has had previous electrology treatments she will perhaps be somewhat informed of that particular technic both by experience and by what she has been told by her previous electrologist. She may have been told half-truths, however, or she may not have understood what truths she was told.

In trying to convince this type of patron, do not discredit her previous electrologist because it is unethical on your part and, also, you are telling her in effect that her previous choice was a mistake. People do not like to be told of their mistakes.

It is always better to keep the telephone interview as short as practical by suggesting an office consultation early in the conversation. But if the person wants to converse via the phone, and you have a patron on the table, tell her your situation and get her phone number so you can call her when you have free time.

What do you say to sell this type of patron? The facts and the truth to the best of your knowledge and ability. If that is not good enough, then be glad that she went elsewhere.

The Personal Interview and/or First Treatment

When the prospective patron arrives in your office you must quickly determine whether additional discussions are in order or whether the patron merely wants to start treatment. If her first questions are about how it feels, suggest that you show her by removing a few hairs rather than trying to explain verbally. As you are starting the treatment, explain softly what you are doing. (Do not let the patron see the needle.) Tell her you are inserting a small probe down alongside the hair. It is the same size as the hair and it goes into the same opening the hair grows out of. You are not piercing the skin so she will not feel the insertion. After the probe is in place tell her that it has been inserted and that she did not feel it—did she? The purpose of this explanation is to reassure the patron that the needle itself is not a source of pain. At the first treatment many patrons tend to shy away from the insertion of the needle, thinking that the pain they have felt was from being prodded or pierced by a sharp point.

Tell the patron when the hair has been released and explain that you will go through the same process for each hair. When using the blend or manual high-frequency, tell the patron that you will advance the current's intensity gradually; the more heat she can tolerate the faster you can perform. Make the patron aware that she determines the speed of hair epilation. The faster you can go the smaller the over-all cost, within certain safety limits, of course.

After a demonstration of this type the patron can understand why her questions of "How many hairs do you remove per hour?" "Is it painless?" "Will I need more than one treatment?" "How long will it take to finish?" could not be answered easily.

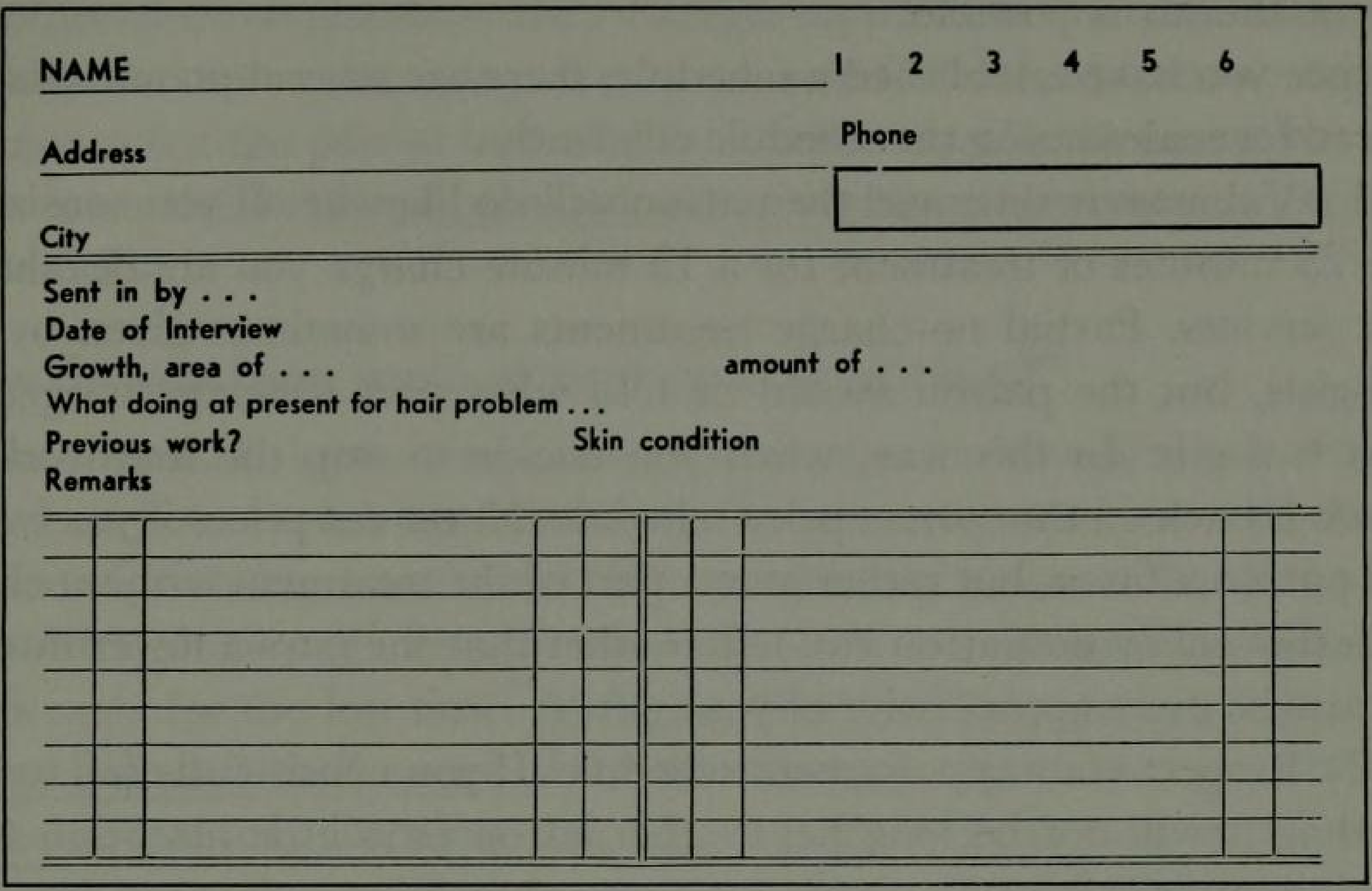
It is common practice for some operators to place all the epilated hair with "good" roots on a piece of cotton and show the patron how many hairs she "killed" today. Out of concern for his patient's feelings, the surgeon does not show the patent what he has removed nor does the dentist show you the extracted tooth. To many people the sight of epilated hairs is equally unappetizing. Abandoning this procedure would enhance the electrologist's professional image.

Regrowth of hair that you have treated should be mentioned briefly even during the first treatment by explaining that any regrowth of insufficiently treated follicles would not appear for at least five or more weeks (if, for example, they were deep terminal hairs) and that hair that appears in the meantime is hair that you have not treated. Explain the shedding process, using hair diagrams or a wall chart drawing of hair replacement cycles.

True, this first treatment procedure takes much time and talking, but it lays the groundwork for completing the case. The electrologist must educate the patron so that she understands the problems involved in hypertrichosis and in its removal. With such an understanding she will become a satisfied, happy patron, and it is only from many patrons of this type that a solid future of referrals will ensue.

The Treatment Record Card

Electrologists differ widely in their views regarding case history information for each patron, but all are in agreement that the patron's record should include as a minimum the following data about treatments: the date, the length of treatment, the area treated and the amount charged. Some operators prefer a ring binder record while others prefer 3 x 5 or 4 x 6 cards. Fig. 176 is a typical 4 x 6 card that provides for the minimum of needed information. The principal reason for treatment record cards is to keep an accurate record of areas treated, in order to set up schedules properly.



NAME 1 2 3 4 5 6

Address

Phone

City

Sent in by . . .
Date of Interview
Growth, area of . . . **amount of . . .**
What doing at present for hair problem . . .
Previous work? **Skin condition**
Remarks

FIGURE 176. *A typical patron record card.*

Scheduling Appointments

In scheduling appointments, the electrologist should be cognizant of the responsibility the patron has placed upon her to eliminate the superfluous hair problem, and should schedule accordingly. When a patient goes to a dentist and has a survey made of her teeth for cavities, she expects a series of appointments to be made to remedy her dental problem. By analogy, the electrology patron should not be asked, "Would you like to come in again?" Rather, she should be scheduled for a series of treatments that will eventually solve her problem. Appointment record books are available for this purpose in several forms in any stationery store.

When discussing appointments with the patron it is just good business sense not to sound as if you have the whole day unscheduled, even if you do. People tend to think that a lack of clients reflects a lack of skill. Instead, advise her of *specific* hours you can treat her on days that are convenient to her. Without really misleading her, you may prevent your prospective patron from making a mistaken inference about your ability.

The length of each appointment and the number of appointments per week will be determined by the number of areas to be treated, the density of the hair on each area, the anticipated skin tolerance, the rate of regrowth, and finally the expenditure your patron can afford. At times it will be necessary to schedule a temporary increase in treatment time to catch up with overlapping regrowth patterns (as discussed in the section on regrowth in a previous chapter). Often an increasingly acute glandular problem will require adjustments in the appointment schedule. Obviously, scheduling relies so much on individual circumstances that no rule of thumb is possible.

Once you have established a schedule, there are several points to be considered for maintaining the schedule efficiently:

(1) Value your time and the patron will do likewise. If you consistently give 25 minutes of treatment for a 15 minute charge you are devaluating your services. Partial no-charge treatments are sometimes given by electrologists, but the patron should be told what part is being charged and what is a gift. In this way, when you decide to stop the free work, the patron is back on the correct price schedule. Never cut prices if you want to do a patron a favor, but rather give a part of the treatment without charge. With this policy no patron can tell another that she pays a lower rate. She will also be more appreciative of your gift.

(2) Respect your appointment schedule. If you consistently fail to be on schedule it will not be long before the patron pays little attention to her appointment times.

(3) Penalize the tardy patron. If a patron is late reduce her treatment time rather than get behind schedule and inconvenience succeeding patrons. Some people are inclined to be consistently tardy and have no real excuse for being so. When such a pattern is obvious it is more profitable to dismiss the case.

Questions Commonly Asked About Business Practice

Although it is not possible to discuss every business problem which might arise in connection with our field, several recurring questions deserve special attention. Those to be dealt with here have been asked by almost every student of the field at some time or other. A few of these involve subject matter which tends to be controversial, but a discussion of such questions is necessary to prepare you adequately for your profession.

"How long is an hour treatment?"

Asking about the length of an hour treatment is not as facetious a question as it may at first appear. The question refers to the method of charging the patron. Do you count from the first to the last insertion or from the time the patron enters the treatment room until she leaves? The policy you adopt will depend, to a large extent, on the way you like to conduct business. The efficient, busy electrologist will value her time and therefore base her hourly rate on the time she spends with the patron, which may result in 50 minutes of actual hair removal in an hour. A less time-conscious operator who wishes to chat with her patron may devote a total of 75 minutes to the patron, while spending only 55 minutes on actual treatment. She will charge for an hour, allowing about 5 minutes for normal pre-treatment and post-treatment time, and the remaining 15 minutes for pleasantries. Still other electrologists base their charges on the time from the first to the last insertion. Some electrologists may use any of the three systems, depending upon what the patron insists upon. Ultimately, the timing system used depends on the individual electrologist, since there has been no set policy for the field.

"How do you keep track of your treatment time?"

If you have the type of mind that enables you to remember what time it was when you started the treatment, then a wrist watch or wall clock is adequate for timing a treatment. You should also, however, be able to keep track of telephone call interruptions so that you can extend the treatment to compensate for the lost time. At twenty-five cents or more per minute the average patron is well aware of the time that goes by without treatment.

Mechanical and electrical timers have a place if they are of the correct type and properly modified for our use. Some electrologists just cannot remember what time it was when they started the treatment, and for these operators an interval timer is a must.

The loudly ticking "kitchen timer" is not desirable because it tends to cause the patron to become overly time-conscious, making her think of the electrologist as mercenary. Spring-wound or electric interval timers used in photography and x-ray work are suitable because of their quietness. Loudness of the bell or buzzer can be adjusted by any serviceman or watchmaker. Some models can be stopped to allow for telephone interruptions and then restarted, continuing the timing without any need for resetting dials or pointers.

The electrologist will experience less mental fatigue at the end of a busy day if she will rely upon an interval timer to do the calculating for her.

"What do you tell the patron who wants a guarantee?"

This is a common and logical question and the electrologist should not be surprised or insulted when prospective patrons bring up the subject. It sometimes requires a lengthy answer depending upon the intelligence level of the patron. To refuse to answer the question at all makes the patron suspicious of your honesty. An answer must be given directly and without hesitation.

Since this problem always crops up in a conversational context, no "pat" answers can be given. The following dialogue is designed to guide you in the kind of answers you might give the guarantee-seeking patron:

Electrologist: "Yes, we can guarantee that any hair follicle that has been treated to the point where all growth potential has been destroyed will never grow another hair, but we cannot guarantee to treat thoroughly every hair we remove in a given treatment.

Let me explain this in another way. Under the skin lies the papilla which makes the hair grow. This is our target. Because we cannot see beneath the skin, we must aim for a target we cannot see. We aim to the best of our skill and ability but we are not always perfect. In every treatment we miss some."

Patron: "Do you mean you have to treat some hair more than once?"

Electrologist: "Yes, but eventually we will get them all."

Patron: "You mean I will never have any more hair on my chin?"

Electrologist: "You will never have hairs growing out of the follicles that were destroyed, but remember—we have not changed or treated your glandular system, which is what made these hairs appear. Any little fine blonde hair presently on your face may be converted into a big coarse hair if your glandular system wishes to do so."

Patron: "You mean all these fine hairs will become big and black?"

Electrologist: "No, as a rule, just a few each year will coarsen. After we get all of your present growth thoroughly treated, you may, like most of my patrons, grow only a few new hairs each year. Two or three fifteen-minute treatments each year will keep you free of hair problems, unless your glandular system undergoes some radical change."

Patron: "Then you can't guarantee to get rid of the hair on my chin."

Electrologist: "I've had it . . . " (leaps out nearby window).

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